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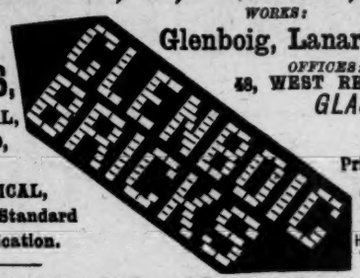


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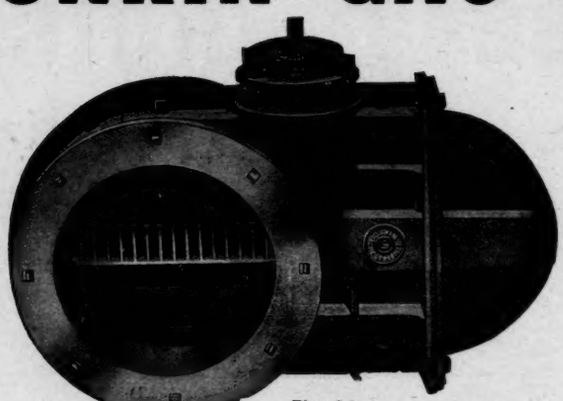

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# JOURNAL OF GAS LIGHTING & WATER SUPPLY.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CXXXIII., No. 2756.] TUESDAY, MARCH 7, 1916. [68TH YEAR.


## EDITORIAL NOTES.

### Price of Coal Act Interpretations.

THE Price of Coal (Limitation) Act has been the birthplace of a good deal of wrangling; and there has been a fresh outbreak in connection with the beginning of contract negotiations for the ensuing year. Two fresh points regarding interpretation have been raised; and on both Sir Thomas Ratcliffe Ellis, the Secretary of the Mining Association of Great Britain, obtained from the Board of Trade confirmation of his reading of the Act. He seems to have sought the views of the Board of Trade at the instance of the Gas Coal Federation. Of course, at one time all knowledge of anything in the nature of a federation, combination, or whatever other name was applied to the body from which united action proceeded in connection with gas coal selling, was denied by some people who are intimately concerned in gas coal transactions. Their knowledge was very much at fault, because Sir Thomas was, in this instance, "instructed " by the Gas Coal Federation," to communicate with the Board of Trade, "in order to prevent differences arising " on these points."

The first question submitted to the Board was, tc put it briefly [the text of the correspondence will be found on p. 521], as to whether, in ascertaining the corresponding price for the prescribed year ending June 30, 1914, it is necessary that the contract of the same buyer should be taken, or whether, if there was a contract with another buyer, *nearer to the corresponding date* of the proposed new sale—providing the coal was of the same description, sold in similar quantities, and under similar conditions—that contract could be taken in fixing the price. The reply of the Board of Trade is that, "so long as the conditions prescribed by section 1 " (1) of the Act are complied with, there is nothing in the " Act which requires that reference should in all cases be " made to a sale to the same buyer." It will be observed from the correspondence that, in putting his case, Sir Thomas used these words: "If there was a sale within the " prescribed period to any other person or company, nearer " to the date of the new sale, *where the price was more favour-* " *able to the vendor*, provided the coal comprised in the last- " mentioned sale was of the same description, and sold in " similar quantities, and under similar conditions, the Act " does not prohibit the price on such last-mentioned sale " being adopted as the basis price for the price under the " new contract." Note the words that are italicized by us: "Where the price was more favourable to the vendor." Sir Thomas was only concerned for the coal vendors, and not for the buyers. But the Act was not framed to bestow preferential conditions within its terms upon the vendor or the buyer. The interpretation, which gives greater freedom in bargaining than was generally supposed to be the case, of course cuts both ways. As it is not necessary, according to the interpretation of the Board of Trade for the sale during the year ending June 30, 1914, to refer to the same buyer, then if buyers ascertain, by any means available to them, the existence of a more favourable contract than their own during the prescribed year (providing other conditions are consistent) they should, if possible, arrange to enter into a new contract at or near the date of that favourable sale. It is obvious that, according to the correspondence, there is nothing to prevent this claim being made.

The next point is also one of especial interest. Most gas coal contracts in this country are entered into during the spring, for (say) the twelve months beginning with July 1. Some buyers have been of opinion that the basis prices which will have to be taken are those ruling for the coals delivered during the year ending June 30, 1914. But this, the correspondence shows, is not so if the contract was entered into on or before June 30, 1913. The Board of Trade says that in the case of a new contract reference must be made to a sale actually effected within the twelve months ending June, 1914. Therefore, in fixing the basis price for contracts which comply in respect of description of coal, quantity, and other conditions, the corresponding sales will be those arranged during the year ending June 30, 1914, though the deliveries only took place during 1915.

### Dyes and High Explosives—After the War.

THAT certain requirements of peace and war are closely co-related, and that the establishment of the means of producing in one direction the needs of peace time supplies a national protection in war time, were points in the notable address of the Chairman (Mr. Milton Sharp) to the shareholders of the Bradford Dyers' Association at their meeting yesterday week. What he had to say bears largely upon the question of whether or not the gas-supply industry will, after the war, continue the policy and work of extracting from gas, by means of the "C" or other process, the benzol, toluol, &c., which are, with carbolic, sulphuric, and nitric acids, among the raw materials from which dyes and high explosives alike are made. We have ourselves very little doubt on the subject. The Government and the country have had such a startling lesson through the war that we shall never be—we cannot be if sanity prevails—allowed to recede from the position to which the war has compelled the country to advance in developing its own resources; if anything, we shall have to go still further forward. If (and this is a fact that should sink well home) we fully establish the aniline dye industry in this country, then we establish at the same time the means of production, in quantities only limited by the amount of coal carbonized, of those first essentials of our hope of ultimate victory in modern warfare.

Germany's success in founding and building-up to its mammoth proportions the aniline dye industry, and its largely established plant for extracting nitrogen from the air, have been the means by which it has succeeded in carrying on war so long, and with the intensity that it has been doing. What it simply did immediately the war started was to turn the huge factories, and the thousands of men employed, from the peaceful work of making aniline dyes on to the manufacture of high explosives, utilizing the same substances; and the production of ammonia fertilizers also at once gave place to the production of nitric acid. We award Germany the palm for original organization of potential resources with a dual purpose—commercial and martial. When, however, we compare the preparedness of Germany in the matter of explosives and its means of rapid larger production with our own shortsightedness and unpreparedness, and then survey what has since been done in this country, there is very deep appreciation of the words of Mr. Milton Sharp when he said: "The country will pro- " bably never know how much it owes to the High Explo- " sives Department of the Ministry of Munitions, presided " over by Lord Moulton, and officered by a body of strik- " ingly able and energetic men to whose commanding force " it is due that the danger from a shortage of high explo- " sives has been so effectively met." This from an independent but interested and keen observer! As Mr. Thomas Canning says in a letter in our "Correspondence" columns to-day, such merited praise must be very gratifying to gas engineers, seeing how much their patriotism and skill have contributed to the conditions which warrant the tribute.

Now we know more than we generally did before the war as to how much the industries of this country are dependent upon a plentiful supply, to an immense annual value, of dyes and colours; and we know, too, it is to its interest to be self-dependent in this regard. We realize, too, that

the country must be in self-reliant position in respect of the materials for high explosives. The provision of the two vital necessaries—the dyes and colours on the one hand, the high explosives on the other—are interconnected. This being so, Mr. Sharp wants to know whether all the work, the experience, the plant, towards which indirectly and directly the Government have contributed a considerable sum of money (this does not apply to any great extent to the gas industry), are to be jettisoned after the war. He hopes not; indeed, they cannot be if the country in the respects mentioned is to be made self-contained and independent. This is one of few ways in which the war has been constructive; and it would, to use an expression employed by Mr. Sharp, be "criminal folly" to, after the war, enter upon the policy of destruction of this piece of good. Mr. Canning asks, in like manner, "if the excellent results which we in "the gas industry have discovered can be obtained by the "use of the Carpenter process and other means are to be "no further developed when the war is over, when it would "be so easy to divert the whole of the products into a new "channel, and place in the hands of England a power in "peace or war of incalculable advantage." It cannot be, and it must not be, that this source of value will be suddenly, or ever, cut off. It is part of the national development that the gas industry should continue this work. Something that the gas industry has is something that will be—in more than one direction—permanently wanted, to the fullest practicable extent. The industry has had remarkably informative lessons forced upon it through inexperience being displaced by experience; and we know now that large contribution can be made to the country's internal and material strength without doing consumers of gas using modern methods any appreciable harm. Mr. Canning is, therefore, suggesting that the Institution of Gas Engineers should take the matter into consideration with organized representatives of the dye users, dye producers, and tar distillers, with a view of urging the position upon the attention of Parliament, and of inducing them to take action "before the terrible words 'too late' are written over the "door of a lost opportunity of such magnitude." The proposal, we hope, will not fall on deaf ears. As an initial step, the Council of the Institution could not perhaps do better than get into communication with Mr. Milton Sharp. The reason for this suggestion is found in what that gentleman had to say on the general subject at the meeting of the Bradford Dyers' Association, as to-day reported in our "Miscellaneous News."

## Investment of Accumulated Gas Funds.

THE administrators of gas undertakings are, as a rule, provident people. They create reserve funds, special purposes funds, capital redemption funds (where they are required, and are allowed by Parliament), superannuation funds, sick benefit funds—in fact, their undertakings are hedged-about with funds with an eye to financial stability, security, and the needs of the future. There is great prudence in all this; but an important consideration is as to what is best to be done with the accumulated money. The general rule is—it is the rule that has had large application in the belief that it was framed by propriety and wisdom—that the money should be invested in securities, preferably gilt-edged ones, outside the business. This is the course, on which we look with a considerable amount of sympathy; but it is a course from which much preference is now being alienated in favour of the action of investing the money in a company's own business, and utilizing it for working or other capital purposes. There has been during recent years heart-breaking depreciation proceeding of the so-called gilt-edged securities; and the directors of gas undertakings with investments in these securities have had to recognize that the amount of the reserves that they placed as solid cash on one side have not the realizable value of the original sum, and substantial writing-down has been necessitated. And, of course, with the war, and with new Government loans at high rates of interest, the various "securities" in which reserves have been invested are in worse case than ever, and just at the time when, the raising of fresh capital for trading enterprise having been prohibited, or its raising only sanctioned on war-bound conditions, the money would have been of the utmost use within the business itself for the provision of the greater stocks which the prevailing conditions compel works to carry, and for maintaining at as high a level as possible the inflow of new business. When all the conditions are looked at in the light of the security depreciation that preceded the war, and of the circumstances of to-day, one finds sympathy veering round from the advocates of investment outside the business to the advocates of investment within the business.

We have before us this week a lament on the subject by Mr. H. E. Jones. It is hidden away in almost the final remarks that he made at the meeting of the Wandsworth, Wimbledon, and Epsom Gas Company last Tuesday. In the flush of patriotism, the Directors have made a fairly considerable conversion of 2½ per cent. Consols (which represented reserve fund and special purposes fund investments) into 4½ per cent. War Loan; and in the operation a sacrifice has been made of only a few pounds short of £7000 on the original investment. If the Company had had to realize the Consols in order to provide the undertaking with ready money, they would, of course, still have had to make a considerable sacrifice. But the difference would have been this, that instead of now holding 4½ per cent. War Loan, the Company could themselves have found profitable employment for the money, and could have afforded to pay 5 per cent. interest upon it. If the money had been originally invested in the Company's business at 5 per cent., no depreciation would have been suffered. The Directors do not by any means regret what they have done in converting from Consols to the War Loan. But when the solid amount that has gone in depreciation confronts them, when the dearness of money is considered, when capital (even if allowed to be raised) cannot be obtained, under current conditions, excepting at below par, or in the case of loan capital at a severely high rate of interest—well, then, it is not surprising that Mr. Jones and his colleagues think that the Wandsworth undertaking could well take charge of its own accumulated funds, allow 5 per cent. interest on them, and permit them to suffer no depreciation through external causes. The subject of outside investment or investment in the business itself of reserve and other funds is an old and oft-debated one; but, as already said, the weight of argument respectively on one side and the other is being shifted by circumstances. Of course, much depends on conditions. A sound well-established gas undertaking is quite a safe repository for accumulated funds; an undertaking of contrary characteristics, or indulging in a business of speculative nature, would not be. A British concern, too, carrying on business abroad should have its reserve and other funds invested at home, rather than in the business in another country. Circumstances alter cases.

## Investigating the Pitch Problem.

THOSE who read last week's issue of the "JOURNAL" carefully will have seen that the question of carbonizing pitch with coal for the purpose of doing something towards making an impression upon the rate at which stocks are accumulating is gaining ground in consideration and experiment. The matter was raised by Mr. Tim Duxbury at the meeting of the Manchester District Institution of Gas Engineers, and by Mr. G. Stanley Cooper, B.Sc., at the meeting of the Coke-Oven Managers' Association; and at both (as the reports published last week show) useful experiences were recounted by members. But, on all hands, we seem in this matter to be still in the experimental stage; and there is as yet nothing to record of practice on continuous large-scale working. There is, of course, a freshness even in the revival of this old idea of pitch carbonization; so that a little time must necessarily elapse before anything substantial is done.

Meantime stocks continue to accumulate, despite the recommendation of the Ministry of Munitions that there should be disposal of pitch by its carbonization. The interest of the Ministry of Munitions in the matter we suppose lies in the fear that the piling-up of pitch stocks may have some effect upon the full operation of tar-distillation plants, and thus upon the recovery of toluol. An outlet for pitch there must be; for, as we have said before, and as Mr. Samuel Glover and Mr. H. Kendrick intimated at the Manchester Institution meeting, the rate at which we are building-up pitch stocks is going to have, unless prompt relief comes, a very bad influence upon the market in the future. In order to ensure that there shall be no slacking off in the operation of tar-distillation plants, the Ministry of Munitions ought to see if they cannot do something more than merely recommend tar producers to enter upon what is

in carbonization practice a complete innovation. Our Allies are wanting briquettes; for briquette making, they require pitch; but they cannot afford to buy it from us because of the rates of freight. Therefore if the Ministry of Munitions could induce the Government to arrange for some vessels at moderate rates of freight for this trade, they would be conferring a blessing all round, and be doing more to relieve the pitch situation than the sluggish tentative work that is now proceeding in this country with the view of determining upon some measure of relief. Moreover, it is coal that the Ministry of Munitions want carbonized, and not pitch, in order to obtain the maximum result in the production of high explosives.

However, there is a disposition to look at the question of the carbonization of pitch from the immediate financial point of view. Of course, it depends upon the price at which the 5 per cent. or other percentage of pitch is put into the retorts with the coal, as to whether or not the practice is profitable; and, as a definite test of this, we should be loth to accept money results calculated on the basis of working experience with easily managed experimental plants. If the figures of Mr. Duxbury (or the prior ones published by us of Mr. Thomas Glover and of Mr. Alex. Yuill) are taken, a ton of mixture—90 to 95 per cent. coal and the balance pitch—does not give working results that vary much up or down from ordinary working. Mr. Duxbury shows little difference in gas make per ton; but there is a small advantage in calorific power. There is an increase in the weight of coke, which is of "good" quality (in one place he says "improved" quality); and there is an increase in the quantity of tar, which, under the conditions of his experimental working, contained more naphthalene, with reduced water content, and the toluol was also diminished per ton of tar from 2·46 gallons to 2·04 gallons—0·42 gallon difference—but per ton of coal carbonized the average production increased from 0·141 gallon to 0·173 gallon. The members who joined in the discussion at the Manchester Institution meeting were, on the whole, of opinion that, having regard to the future position of tar, the carbonization of pitch, when properly intermixed with coal, was a feasible economic proposition under current circumstances. This is the way to look at the matter. So long as the carbonization of pitch does not impose any present disadvantage—financial or working—then the extent to which it is carbonized now will be a gain for the future.

From the remarks on the subject at the meeting of the Coke-Oven Managers' Association, it appears that not much progress has been made in experiment with pitch carbonization at the coke-ovens; and what experiment there has been does not seem to have been consistently carried out by proper application. It is the opinion of Mr. Stanley Cooper that, for the purpose which is urging interest in this matter, coke-ovens can without disadvantage do a practical part in relieving the present congestion, and the still growing congestion, of the pitch-stores up and down country. Other coke-oven men think the same; but some again have not had a particularly good experience. This, however, appears to have been largely due to faulty or haphazard mixing of the pitch with the coal, although known percentages of pitch were employed. Under this condition, the flame and smoke were so great on the introduction of a charge that the men could not get sufficiently near to put the oven-lids in position. Intimate admixture, and the use of a hard pitch from which some of the lighter constituents have been removed, make a great difference in coke-oven working. In his article in our columns on Feb. 1, Mr. Thomas Glover remarked: "The coke-oven manager may take an im-
"portant part in this beneficial movement; and probably
"greater direct benefits accrue in the case of coke-oven
"products, and in the financial results of working, than in
"those of a gas-works." The discussion at the Coke-Oven Managers' Association indicates that some of the members are a little doubtful as to "direct benefits," save in the one respect that the use of a proportion of pitch may permit of the utilization of inferior coals and even non-coking coals, and yet, through the binding action of the pitch, produce hard coke of good size. This would be a direct advantage if only it proves to be true; and we see every reason why it should do so. However, the President of the Association (Mr. George Chrisp) is proposing to make experiments with non-coking coals and pitch; and the issue will be awaited with much interest. Meantime pitch accumulates; and any measures taken to produce relief should be applied as quickly as possible, and not at the end of the war.

## Reported Government Control of Gas-Works.

There has been a little trouble with certain boiler attendants at the works of the Edinburgh and Leith Gas Commissioners. They are under the impression that they deserve an increase of wages in addition to the war bonus, and, because they could not get what they wanted without arbitration, they threatened to strike. The gas undertaking, in common with several hundreds of others, is working for the Ministry of Munitions; and, in the difficulty, the Department was approached by the Commissioners with a view to having the works placed under Government control, and so prevent stoppage of any part of the operations. The point of general interest about the matter is that the deputation to the Ministry of Munitions was informed that an order is to be issued shortly with the view to bringing under the Munitions of War Act, 1915, and the Amendment Act of 1916, all those gas undertakings that are assisting in the recovery of benzol, toluol, &c. At many gas-works, the loyalty of the men is such that they would just as soon think of deliberately inflicting some personal injury upon themselves as to harm in any degree the national cause and the public service in these times when every man's work is required of him in contributing to the defeat of the enemy. But there are other works where there has been unrest, and where men have actually ceased work during the war. We will not say all that such men deserve to have said of them. It is through such men that the reported action is necessary in the matter of Government control. The Edinburgh and Leith Commissioners have already received regulations which place their manufacturing plant, but not finance, under control. Now questions in dispute must be referred to arbitration. It will be noticed from a report elsewhere that, apart from the question with the boiler attendants, an enhanced war bonus has been (with certain exceptions) granted to the Commissioners' employees.

## Farmers and the Price of Sulphate of Ammonia.

If the farmers do not quickly make up their minds on the subject of sulphate of ammonia, the Government should relieve the present absurd situation by again allowing free export. It was for the British farmers' especial benefit in the way of large supplies that exports were stopped, although prior to this event, and when sulphate of ammonia was much cheaper, the farmers only absorbed about a third of the production of the United Kingdom—the immense remainder having to find markets abroad. The agriculturists really got the Government to prohibit export under false pretences. When they moved in the matter, it was represented that, in the presence of the shortage of other fertilizers, and in view of the demand, and the high prices obtainable, for land produce, there would be little difficulty in absorbing the home yield of sulphate of ammonia. Their action in holding back from purchasing now shows that the object of their successful move in prevailing upon the Government to prohibit exports was—though they are getting high prices for their produce, though coal, sulphuric acid, labour, and all other expenses have grown tremendously for those engaged in sulphate of ammonia making, though the markets of the latter have, as the event shows, been ridiculously curtailed—to bring down the price. The £16 10s. per ton fixed for February is below the values that have lately been reached; but because prices have not come down with a run, the farmers are leaving makers in possession of growing stocks, although at the price at which the commodity is being offered, it gives the farmers one of the cheapest forms of nitrogen for fertilizing purposes. Still, instance after instance of their agitation for price reductions occur—one of the latest being reported in our "Miscellaneous News" columns to-day.

## Innocuous Gas-Fires.

It will be seen from an article elsewhere in this issue that the first report of the Committee appointed for the Investigation of Atmospheric Pollution has been published; and it is a very valuable document. The Committee is one in which there can be the utmost confidence; and the names of the members are an assurance that the work in hand will be done in a conscientious and thorough manner. Armed by the report, those who are engaged in the work of supplanting smoke-producing means of heating by smokeless ones will find that those who try to oppose them on hygienic grounds will have a difficult task. The Committee allude to the innocuous character of the gas-fire compared with the coal-fire. The tarry and carbonaceous substances produced by the

use of raw coal have no part in the products of combustion of a gas-fire. In the case of a coal-fire, consuming 21 lbs. of coal per day, besides the tarry and carbonaceous products, some 1500 grains of sulphur in various forms are evolved, as compared with only 50 to 60 grains in the case of a gas-fire consuming 200 cubic feet of gas per day. The Committee, in fact, put the case for the gas-fire in a nutshell from the air pollution point of view, when they state: "The products of combustion from a gas-fire consist mainly of carbonic acid and water vapour, together with a minute quantity of sulphur oxides." Contrast this statement with what precedes it as to the constitution of soot and the emanations of a coal-fire chimney, and all right-thinking people will plead for the hastening of a general transfer from the use of crude coal to the employment of gas or coke in all heating operations.

### Tar-Surfacing and Atmospheric Pollution.

Reading the report, however, we have a rude shock. The Committee state that tar in the atmosphere is produced not only by the imperfect combustion of coal or wood, but, recently, by the introduction of the practice of tarring roads. It is not clear what evidence the Committee have that tar-surfacing of roads is a contributory source of the tarry element in the atmosphere. Looking down the columns in the tables referring to tar, there does not appear to be any distinct testimony of road-tarring operations having contributed to the tarry element in the atmosphere. It would be very difficult in the industrial areas to trace this, owing to the local manufacturing conditions. But it may be assumed that, in and round about such a neighbourhood as Malvern, road-surfacing by tar is largely indulged in, and yet the figures applying to that area do not suggest anything more than what one might assume would be found as the result of the ordinary combustion of coal in the district. The figures in the tables are given in metric tons per square kilometre; and for the twelve months ending March, 1915, they are for Malvern as follows: April, 1914, 0·00; May, 0·02; June, 0·01; July, 0·01; August, 0·01; September, 0·01; October, 0·00; November, 0·01; December, 0·01; January, 1915, "Trace;" February, 0·00; and March, 0·00. Since the war started, there has been comparatively little road-tarring done in the country; so that any general assertion as to road-tarring having contributed to the tarry element in the atmosphere should at present be avoided, or have reference to time and place. We should like to see figures for twelve months from a district prior to the road-tarring practice being commenced, and then for a normal year of road-tarring, to ascertain whether there were any perceptible differences. Of course, variations in local and atmospherical conditions would affect the results; but we should hesitate to accept without stronger evidence that the tarring of roads has had much, if any, effect on the quantity of tarry substance found in the atmosphere. Even if there has been some effect, the compensations of road-tarring are worth it. We have through the practice a cleaner atmosphere, a less quantity of irritating substances is mixed with the air we breathe, the foliage of trees is kept free from choking dust, and local economy is promoted by greater road durability. Of course, these are things the Committee would not dispute; and the remark in the report to which we have referred was not, we feel sure, made in depreciation of the practice.

### Domestic Supply Prices.

The time is hardly propitious for voicing requests for a cheaper supply of gas—though isolated cases of a lowering of price have come to hand, even during these days of abnormally high costs of materials and labour. But supposing the time was one in which there existed general circumstances that would seem to warrant an application for some concession in the price charged for gas, then one would anticipate that Sheffield would be almost the last place where such a demand would be made. Sheffield has long enjoyed the undoubtedly great benefit of a cheap gas supply, though, as is the case in the overwhelming majority of other places, prices are somewhat less favourable now than they were before the war broke out. The writer of "Engineering Notes" in the "Sheffield Telegraph," however—possibly realizing that there can be no harm in asking—says, "Let us have cheaper gas." The system of charging 10 per cent. on the rateable value of a house, and a halfpenny per unit for all current consumed, has caught his fancy; and he inquires whether the Gas Company ever considered some such system of charging. It is highly probable that they have, and that as a result they concluded that the most satisfactory plan was to charge ordinary domestic consumers, both large and small, at one rate—the lowest that due consideration for the rights of the stockholders would justify. The advisability of charging differential prices for domestic purposes is a question that has been many times debated, and is one upon which opinions have naturally not always agreed; but gas undertakings have, at any rate, not felt the necessity of imposing the complicated systems of charging which have in so many cases constituted a feature in the operations of their electrical competitors. For regular consumption for power and industrial purposes, the Sheffield Company, of course, allow terms which prove very inviting to manufacturers; but this policy is governed by different considerations from those applying to domestic consumers—of no doubt irregular demands—of giving "a liberal discount on the last quarter, if a certain amount of gas has been used during the year." There is no wish to judge the case for the Directors of the Company, who are quite able to appraise at their true value the arguments adduced. We are only surprised, as has been said before, that Sheffield should be the place selected for this demand for cheaper gas.

## OBITUARY.

Much sympathy will be felt for a family bearing an honoured name in the gas profession, at the announcement of the death last Wednesday at Armagh of Mrs. WHIMSTER, the wife of Mr. James Whimster, J.P., the Engineer and Secretary of the Armagh Gaslight Company. One of Mrs. Whimster's sons is Engineer of the Bath Gaslight Company, while another one has for some years been assistant to his father at Armagh.

When presiding at the annual meeting of the Carmarthen Gas Company, Mr. John Lewis (the Mayor) said the Directors much regretted that during the past year two of their former employees, who had joined the army, had passed away—one was killed in action, and the other died while in this country. Another employee was in hospital in Egypt. They all extended their deepest sympathy and condolence to their respected Manager (Mr. B. A. Lewis) and Mrs. Lewis in the great loss they had sustained by the death of their son Harry, who was clerk in the Company's office for many years.

Sorrow was expressed on all hands at Exmouth on Monday of last week when it became known that Mr. J. T. FOSTER had passed away. Deceased had been in failing health for some years; and it was largely in consequence of this fact that in May, 1914, he tendered his resignation as Secretary and Manager of the Exmouth Gas Company, a position he had held for 28 years. The loss of his only son, Second-Lieutenant J. S. Foster, of the 9th Somerset Light Infantry, who went down with the transport "Royal Edward" in the Ægean Sea last August, was a great grief to him; and it was generally anticipated that, in his already enfeebled condition, Mr. Foster would not long survive such a severe shock. Under his able management, the gas-works were remodelled again and again. There were only four employees—two stokers and two yard men—when he joined the staff in 1886. On his retirement, however, the staff numbered well over fifty, and included ten or a dozen fitters. In 1886 the make of gas was about 13 million cubic feet; while in 1913, the last year of his management, the Company manufactured 72½ million cubic feet. Only a month or so before his retirement, Mr. Foster had the satisfaction of obtaining for his Company the public lighting contract for Exmouth for a period of ten years; while the last enterprise under his direction was the opening of showrooms.

At the next meeting of the Illuminating Engineering Society on the 21st inst., there will be a discussion on "Some Aspects of the Design and Use of Glassware in Relation to Natural and Artificial Illumination."

The annual meeting of the Midland Association of Gas Engineers and Managers has now been definitely fixed for Thursday, the 23rd inst., at the Grand Hotel, Birmingham, when the President-elect (Mr. Charles H. Webb, of Stourbridge) will deliver his inaugural address.

The second industrial fuel number of "A Thousand-and-One Uses for Gas" contains the continuation of an article by a Furnace Expert, based on the paper read a short time ago by Mr. B. W. Brooks, of the Gas Light and Coke Company, before the London and Southern District Junior Gas Association.

Among recent wills proved are those of Mr. Jabez Light, late Deputy Chairman of the South Suburban Gas Company, who left a gross personalty of £43,867; of Mr. J. H. Campion Coles (the predecessor of Mr. J. S. Garrard as Secretary of the Eastbourne Gas Company), the gross value of whose property was £61,458; of Mr. Thomas Parker, of Ironbridge, Salop, known to "JOURNAL" readers in connection with the "Coalite" companies, who left estate valued at £13,380 gross; and of Mr. John Gilbert Russell, of Aldridge, Staffs. (of the firm of Russell Bros., tube manufacturers), who left £111,510 gross.

## PERSONAL.

Mr. J. G. Newbigging, jun., who is on active service in France, with the 18th Royal Fusiliers, attached to the 251st Mining Company of the Royal Engineers, is returning to England for a few weeks' convalescence, having been in hospital for some time suffering from trench fever. While in England, he expects to take up a commission in the Royal Engineers, which was offered to him some time ago.

In succession to the late Mr. O. Pihl, the Board of Directors of the Christiania Gas-Works, at their meeting on the 25th ult., appointed (subject to confirmation by the Commune) Mr. J. G. Tooms as Engineer and General Manager of the present works, in addition to his former position of Chief Engineer for the construction of the new gas-works in the city. Mr. Tooms, it may be remembered, was formerly Manager of the Waterford Gas-Works, and was for many years a prominent member of the Irish Association of Gas Managers.

The salary of Mr. W. B. Leech, the Engineer and General Manager of the Leeds Corporation Gas Department, has been increased by the City Council from £800 to £1000 per annum. In submitting the recommendation of the Gas Committee to this effect, Alderman W. Penrose-Green (the Chairman) said that, when Mr. Leech was appointed, he was debarred from consulting work and from giving expert advice; and there was a tacit understanding that, if he carried out his duties satisfactorily (as he had done), the Committee would recommend an advance of £200 a year. An amendment that no advances be made in respect of salaries of over £200 a year was defeated at last week's meeting of the Corporation; the Committee's minutes being approved by 27 votes to 14.

## NEW COAL CONTRACTS AND THE PRICE OF COAL (LIMITATION) ACT.

### Fresh Interpretations.

Acting upon instructions received from the Gas-Coal Federation, Sir Thomas Ratcliffe-Ellis, Secretary of the Mining Association of Great Britain, has obtained two fresh interpretations of the Price of Coal (Limitation) Act, with special reference to the fixing of the basis price for new contracts.

#### The Points for Decision.

The letter sent to the Board of Trade by Sir Thomas Ratcliffe-Ellis is as follows:

The time is approaching when gas companies will desire to make arrangements for their new contracts; and a question has been raised which may cause difficulties in the negotiations.

I am told that there is a prevalent opinion among buyers that a purchaser desiring to make a new contract is entitled to have the price fixed by comparison with the corresponding price in the expiring or expired contract. I have advised the coalowners that the Act does not require that the corresponding price shall be so ascertained. It may be that the price under an expiring or expired contract, in a particular instance, may afford the proper data in that case, upon which the price for the new sale must be fixed, in compliance with Section 1 of the Price of Coal (Limitation) Act; but that if there was a sale within the prescribed period (the year ending June 30, 1914) to any other person or company, nearer to the date of the new sale, where the price was more favourable to the vendor, provided the coal comprised in the last-mentioned sale was of the same description, and sold in similar quantities, and under similar conditions, the Act does not prohibit the price on such last-mentioned sale being adopted as the basis price for the price under the new contract.

Another question which has arisen is, whether the price under a sale of fuel made before June 30, 1913, can be taken as the basis for ascertaining the corresponding price under a new contract. Whatever may be the position with reference to such a question under a revision of an existing contract, I have advised that the corresponding price with respect to a new contract must be fixed with reference to a sale made in the twelve months ended June 30, 1914, and cannot, under the provisions of the Act, be compared with the price under a sale made before June 30, 1913.

I am instructed by the Gas-Coal Federation, in order to prevent differences arising upon these points, to ask if the Federation may be favoured with an official opinion of the Board of Trade as to whether the opinions I have expressed are those in which the Board of Trade concur.

#### Board of Trade Reply.

In reply to your letter of Feb. 4 on the subject of the Price of Coal (Limitation) Act, I am directed by the Board of Trade to say that they agree that—

As long as the conditions prescribed by Section 1 (1) of the Act are complied with, there is nothing in the Act which requires that reference should in all cases be made to a sale to the same buyer;

And further that, in the case of new contracts, reference must be made to a sale effected in the twelve months ended June, 1914.

## ELECTRICITY SUPPLY MEMORANDA.

The London Borough Councils owning electric supply undertakings have lately been trying to get rid of pressure-testing by the London County Council. The reason for this is not altogether clear. The Councils speak of their desire as referring only to the period of the war; but we have some suspicion that they would like to see pressure-testing permanently abolished. The asserted reason for the desire is that the Government advise financial economy while the war lasts; but it would be interesting to know the amount of the economy to the individual electricity supply undertakings that would be achieved by the discontinuance of pressure-testing. The testing stations have already been equipped; and even the aggregate annual outlay cannot therefore now be a weighty matter. In the event of the failure of this contention as to financial economy, the Borough Councils also refer to the waste of men that the testing involves, when manual power is so much in demand. The work associated with pressure-testing is of a kind that does not require men coming within the military age. The County Council have given courteous consideration to the representations of the Borough Councils; but they cannot find that the Borough Councils have made out any substantial case for discontinuance. Then "Meteor" of the "Electrical Times" stepped in, and apparently thought to help the Borough Councils by being funny and extravagant.

**Official Pressure Testing.**

In his comments upon the subject, "Meteor" writes for amusing effect and little else. He derides the County Council and all their works in this connection, accuses them of only wanting to assert their overlordship in this particular matter, of doing this at considerable expense—in fact, thousands of pounds sterling were entailed in providing this testimonial to the "majesty" of the London County Council; and from all this expenditure only "foolish little inspection stations" issued. There came through the post to the "Electrical Times" office a letter from Mr. E. W. Low, who, believing in calling a spade a spade, told "Meteor" that he was writing "absurdities and inaccuracies." The County Council, of course, carry out this pressure-testing in compliance with their statutory obligations, and nothing else. There is no "overlordship" or "majesty" in the matter. Mr. Low also wanted to know why the Borough Councils sat quietly by while (if true) "thousands of pounds sterling" were being spent by the County Council on "foolish little inspection stations." "Meteor" climbed down. He could not supply a direct reply to the criticism of this particular absurdity of his, which came of not giving some proportion to his selected hyperbole, and so preventing one point abrogating another by inconsistency. "Meteor" also suggested that, if the pressure inspection stations be discontinued, several miles of good chart paper could be saved every month. Several miles of chart paper in these "foolish little inspection stations!" As a matter of fact, about 12 inches of chart paper will go the round of twenty-four hours. The editorial reply to "Meteor's" critic did not touch the practical points raised. There was a little wordy meandering round about; but a respectful distance was maintained from the solid criticism. But as one reason for not testing electrical pressures (about electrical pressures some rather cutting things have been said by people who have experienced their varying effects in lighting and heating work), the editorial mind suggests that "if there is the slightest thing wrong with the pressure of the electrical supply, it is obvious to the consumer." Maybe; but what can the consumer do in such an event? There must be some body to look after his interests; there must be some means of making actual test, and some official record, in order to ensure effort being made to keep things right. No one would be prepared on the mere *ipse dixit* of a consumer to bring a borough council or company to book for erratic voltages. Something more is required.

**Contradictory Hyperbole.**

It is also pointed out, presumably as a reason why London should not have electrical pressure-testing applied to it, that this is not done in the provinces. But a start must be made somewhere. The gas industry knows something about this. London has very often been the starting-place for the application of new gas legislation; and gas supply is now tested for all sorts of things in city and country town alike, with penalties attaching for deficiency. Why the gas industry, and not the electrical industry? But where electricity supply has the advantage of the gas industry is that the major number of provincial electricity supply undertakings are in the hands of local councils, who are also the testing authorities. If, therefore, they do not want to have the electricity supply tested for pressure, they are not likely to incorporate the power in an Act of Parliament or Provisional Order. As a matter of fact, it is not much good a local authority testing against itself, for reasons that are so palpable that the space required to mention them here may well be saved. However, the London County Council do not see any reason why testing-stations brought into being at an expenditure of "thousands of pounds sterling" should lie idle during the war, if a better case cannot be presented than that submitted by the Borough Councils, and the singular one in support prepared by "Meteor."

**Testing in the Provinces.**

**Lamp Flicker and Small Plants.**

Fluctuations of voltage will cause variation of illuminating power of incandescent electric lamps; but what is known as flickering has generally been associated with arc lamps and not incandescent ones. A writer hailing from India tells the "Electrical Review" that he has under his charge three Belliss-Crompton direct-current generating sets, rated at 50 and 100 KW. at 450-550 volts. A single machine at present works at one time; and the load is metal-filament lamps and fans. With this plant, he experiences trouble with a flicker of the lights, which seems to synchronize with the engine beat; but no one appears to be able to assign a cause for it. It does not always occur, but is sometimes scarcely noticeable, and at other times it becomes objectionable. All the machines seem to be affected, but not to the same extent—the small set being the worst, and one of the 100-KW. sets. The third set very occasionally gives trouble, and then only slightly; and it has been found that changing over to this set will stop the trouble. The flicker appears to start at half load on the first two machines, when the bus-bar voltage is about 485-490. The machines have only been in use two years, but this flicker was noticed from the beginning. The writer is very anxious to find an explanation of the peculiarity and a means of remedying it. No doubt. Jumping lights are things that people cannot tolerate.

**The Passing of Arc Lamps.**

In American cities the arc lamps that have been engaged in the duty of street lighting are now being mercifully sent into retirement and the nitrogen filled "half-watts" are taking on themselves the public function. The intelligence comes *viâ* the "Electrical World" that all the arc lamps in New York are to be replaced by large gas-filled tungsten lamps, under the terms of the contracts entered into for 1916 with the different lighting companies supplying the city. The new gas-filled lamps will range from 100 to 400 watts in size; and the ordinary type tungsten lamps from 40 to 100 watts. During 1914 the city finally decided to discontinue the use of flame arc lamps. Beginning with 1915, there were in service 18,211 arc lamps, many of which were superseded during the year by gas-filled tungsten lamps, while this year the remainder are to be replaced, resulting in a saving in the larger sizes of about $10 a lamp over the arc lamps. It is stated that, besides saving money, it was found by careful investigation that the gas-filled unit afforded a more uniform distribution of light than the arc lamp, without glare or flicker, and had much greater penetrating power in stormy or foggy weather. Where city or town authorities prefer for street lighting electric lamps without considering the higher efficiency for the purpose of high and low pressure incandescent gas-lamps, then let us by all means have the most efficient type of lamp. Unless, however, the filament of the nitrogen-filled lamp is screened from view, we dissent from the statement that it is without glare.

**Electric Cooking Installations.**

We have taken the liberty of purloining from the "Electrical Times" a recently published table which includes all the installations that can be scraped together of electric cooking apparatus of any magnitude. These installations are the result of many years' hard work, supplemented by the comparatively little amount of installation in smaller business and public establishments and private houses, which installations ebb and flow in number in an interesting manner, particularly to those gas managers who have appeals for help, and the installation of gas-cookers. The table is as follows:

| Name and Town. | Date Opened. | Total Loading. KW. |
|---|---|---|
| Munition Works, near Newcastle | 1914-5 | 250 |
| Torquay Pavilion | 1912 | 140/150 |
| Euston Station Restaurant | 1915 | 130 |
| Blackpool Tower | 1914 | 119 |
| Bradford Kursaal | 1915 | 102 |
| Debenham and Freebody, London | 1911 | 100 |
| Park Prowitt Asylum, Basingstoke | 1916 | 96 |
| Regent Street Polytechnic | 1912 | 93 |
| Selfridge and Co., London | 1915 | 90 |
| Swan and Edgar, London | 1916 | 80 |
| Whitehall Café, Derby | 1915 | 70 |
| Bank of England | 1913 | 70 |
| Tricity House, Oxford Street, W. | 1912 | 70 |
| King Edward VII. Hospital, Sheffield | 1915 | 63 |
| Bunting's Rest, Norwich | 1913 | 60 |
| Old Ship Hotel, Brighton | 1913 | 60 |
| Dudeney and Johnson, Luton | 1915 | 60 |
| Harvey Nichols, Knightsbridge | 1913 | 57·2 |
| Winter Street Hospital, Sheffield | 1915 | 57 |
| Swan and Hunter, Wallsend | 1915 | 55 |
| B. and K. Restaurant, Earl's Court | 1913 | 52 |

First of all, note the years of installation, which tell of slow growth. Then observe the number of substantial installations which the electricity industry has succeeded in getting in five years; then deduct those installations which are simply advertisements for electricity supply departments; make a further deduction of those to which special terms (unadvertised) have been conceded, in order to give the electricity departments something about which to talk; and, finally, make some allowance for those installations which have been made through the existence of personal influences. The table will then have a very thin appearance. But all told these installations—advertisements, decoys, &c.—are but a drop in the ocean of requirement for cooking apparatus, such an immense part of which is now supplied by the gas industry.

**Electrical Wiremen.**

In most cities and towns, one gas engineer and one or more assistant engineers, with chiefs over the various departments, are all the technically trained officials required; but it would be a bad look-out if the business supporting such a staff could only give employment to an equal, or a smaller, number of fitters. The same with electricity undertakings. But though there should be a large excess in number of efficient wiremen over the engineering staff, information published in the electrical papers shows that there is quite a rush of candidates for the City and Guilds of London Institute examinations in "Electrical Engineering," but in "Electric Wireman's Work" there are relatively few candidates. Last session's report shows that electrical engineering was taught at 117 centres, and electric wireman's work at only 57. There were 1341 candidates for examination in "Electrical Engineering," and only 253 in "Electric Wiring." The number 1341 excludes telephony, telegraphy, and electro-metallurgy. An electric wireman should have a good technical knowledge of his work to prevent him making silly blunders; and therefore it is surprising that the figures as to the candidates were not reversed. The reason for this state of things is not clear. Perhaps the gentlemanly calling of an "electrical engineer" has greater attractions to some than the less gentlemanly calling of electric wireman, though certain electrical engineers are not paid much better salaries than a wireman's wage, notwithstanding the responsibilities of the latter are much less. Perhaps, too, some reason for the disproportionate figures is to be found in the amount of skilled supervision that is required to see that the thousand-and-one rules that are supposed to be needed to make an electricity supply safe (but which do not always do so) are observed, and in the skilled inspection that is requisite of such things as electric cooking and heating appliances, electric motors, and so forth. Of course, all those who pass the City and Guilds examination in "Electrical Engineering" do not find an electric station waiting anxiously for an engineer-in-chief or an assistant engineer. If 1341 candidates for the "Electrical Engineering" examination can be found in a war year, the number of those who have sat during the passing years to demonstrate their proficiency must be an enormous one. No wonder the supply of electrical "engineers" far exceeds the demand.

## A New Light Screen.

At the moment of noting a new, and additionally stringent, lighting restriction order for the metropolitan district, we are also able to draw attention to an anti-aircraft light screen which is being introduced by Messrs. Falk, Stadelmann, and Co., of Farringdon Road, E.C. Where street lighting is still carried out, it is, throughout the greater part of the country, under very subdued conditions; and the efficacy of the "Diffusa" screen (which, it may be remarked, is provisionally protected) should be tested by lighting authorities and engineers in such areas. The screen consists of a series of three conical metal rings, finished dead-black, placed one above the other, in such a manner as to cut off all upward rays, avoid the production of bright spots of light, and yet afford satisfactory and well-diffused illumination at all angles below the horizontal. It is thought that an arrangement of this kind will have advantages over the plan of shading, painting the tops of globes, masking the greater part of the depth of lanterns, or coating with opaque lacquer, which results in spotty illumination. In addition to streets, the screens are suitable for use in factory and goods yards, wharves, railway stations, camps, or in any position where some lighting is necessary, but where that which is provided must be shielded from the view of hostile aircraft; and they are designed to be employed in connection with upright or inverted gas-lights and electric lamps. For use with Kern and similar upright burners, hooked supporting metal straps at the top of the screens can be easily adjusted to suit glasses of different diameters; while for the "C" burner, there is a wire cradle, which rests on the gallery of the burner. When attached to inverted burners, metal straps are passed through the reflector opening, and bent back in such a way as to allow of glasses being fitted in the usual manner. From what has been said, it will be gathered that the attachment of the appliance calls for no alteration to existing lanterns or reflectors. It is out of no disrespect to the "Diffusa" screen that the hope is expressed that the need for its use may very soon be altogether a thing of the past.

**Military Service Act Appeal Tribunals.**—Last Tuesday's "London Gazette" contained the names of members of Appeal Tribunals appointed to sit in different areas, under the provisions contained in the Second Schedule to the Military Service Act, 1916. On the Tribunal for the County and City of London there are twenty-five members, one of whom is Mr. Charles Carpenter, D.Sc., the Chairman of the South Metropolitan Gas Company. One of the fifteen members on the Tribunal for the County of Norfolk (including Norwich and Great Yarmouth) is Mr. Edmund G. Smithard, J.P., the Manager of the King's Lynn Gas Company.

# UTILIZATION OF WASTE HEAT IN GAS-WORKS

## FOR THE RECOVERY OF FODDER AND FAT FROM KITCHEN REFUSE.

An article by Dr. A. Frank, a Professor at Charlottenburg, on the recovery from kitchen refuse of dry fodder and fat by the aid of the waste heat from gas-works and other industrial works, was recently published in the "Journal für Gasbeleuchtung." Some points in the article are of special interest to gas engineers, while throwing light on the difficulties being experienced in Germany in obtaining supplies of fat and feeding stuffs. The following is a summary of the article.

The cutting-off of the importation of fodder into Germany has drawn attention to hitherto neglected native sources of feeding stuffs, and especially to the large daily production in big towns of household and kitchen refuse. On Nov. 27, 1914, the Ministers of Agriculture and of the Interior caused a circular to be issued in Prussian towns urging the local authorities and the inhabitants to take steps to prevent the waste of such refuse. Local conditions and customs, and the necessity for the provision of new plant for dealing with the refuse, prevented any extensive adoption of the recommendations. To the technical man, however, it was clear that if kitchen refuse were rapidly dried in suitable plant—being thereby disinfected and concentrated—it could be transformed into a marketable concentrated fodder. The Ministers quoted Professor Hansen, of Königsberg, as their authority for the statement that by drying kitchen refuse there could be produced a refuse meal having a food value of 67·3 to 68·3 per cent., compared with 67·9 per cent. for winter barley, and exceeding that of wheat bran, which, notwithstanding its high proportion of 9·8 per cent. of albumen, has only a total food value of 42·8 per cent.

The importance of these figures is shown by the fact that in 1913 Germany imported for maintaining its live-stock 3 million metric tons of winter barley and 1·4 million metric tons of bran, in addition to 3·3 million metric tons of other concentrated stuffs. Dr. Frosch, the Director of the Hygienic Institute of the Veterinary College at Berlin, has shown that the material produced by drying the refuse is completely sterilized and harmless, and that it may be advantageously used for fodder both for milch cows and fat stock. The demand for fodder has increased to such an extent that the normal price in time of peace, of £5 10s. per metric ton, is now nearly trebled; yet the scheme for the manufacture of fodder on the lines indicated has made only slow progress. This is partly due to indifference and lack of intelligence on the part of the housewife, who will not undertake to separate useful refuse from the ashes, crockery, paper, &c. In unorganized working, also, the cost of manufacture is very high. Lately, however, stress of circumstances has led to some improvement; and more careful separation of kitchen refuse from the rest of the household refuse has been made obligatory, and is being carried out.

A most important point in the scheme, however, is that, in addition to economy of fuel in the drying process, advantage should at the same time be taken of the recovery of the large quantities of fat from kitchen refuse. The desired economy could easily be achieved by substituting the waste heat which escapes through the chimneys of large works (especially of gas-works) for special furnaces for heating and drying. This heat should at the same time, it is pointed out, be utilized to extract by previous treatment with hot water the fat of the refuse from its solid constituents. Professor Rubner has estimated the quantity of fat going to waste in towns at 20 grammes (0·7 oz.) per head per diem. If it is assumed that only one-quarter of this fat could be recovered from kitchen refuse, it represents a very large value. Such fat is in great demand for the manufacture of soap and lubricating oils, and in normal times fetches £20 to £25 per metric ton, and now more than three times that value. An indirect advantage of the washing of kitchen refuse with hot water for the extraction of fat is that there is at the same time matter removed from the fodder that is injurious to animals—such as pickling liquor and salt, and metallic, glass, and earthenware particles. These particles sink to the bottom in the washing process.

In regard to the utilization for the extraction and drying process of the waste heat in works, gas-works are specially indicated, because the waste gases from the retort-settings or regenerators are not merely free from smoke and ash but in them combustion is nearly complete, while the proportion of oxygen is small. They have the high temperature of 550° to 650° C. (about 1020° to 1200° Fahr.); and the large quantity of heat represented thereby has hitherto been completely dissipated in the open air. For instance, the Berlin Corporation Gas-Works, in the year 1913, carbonized about 917,000 metric tons of coal, from which about 70 per cent. (or 640,000 metric tons) of coke was produced. Of this coke, about 14 per cent. (viz., 130,000 metric tons) of the weight of coal carbonized was used for heating the retorts. Purely for gas production only one-half of the heat from this amount of coke is required. Consequently, the rest—viz., the heat from 65,000 metric tons of coke—has hitherto escaped utilization. Berlin (exclusive of the suburbs) has now a population of 2,071,000; and, with the ample allowance of 250 grammes (0·55 lb.) of concentrated kitchen refuse per head per diem, it can be shown that in the slackest period of the summer months the waste heat from gas-works would fully suffice to produce a concentrated fodder by drying the refuse. The increased gas production of the autumn would admit of large quantities of potatoes being converted by drying into potato cake, which can be stored indefinitely, and has been shown to have a high value as human and animal food. At the same time the waste heat of gas-works could be utilized for drying industrial refuse which might serve as food—such as the large quantities of spent grain and malt sprouts from breweries.

In Greater Berlin, with 3½ million inhabitants, there are also the English Gas-Works and a number of others in addition to those of the Berlin Corporation. The circular of the Prussian Ministers was sent to all Prussian towns having a population of 25,000, and therefore aggregating about 20½ million inhabitants, corresponding with a production of kitchen refuse from which a quarter of a million metric tons of dry fodder might be recovered. The whole of the 1335 German gas-works carbonized in 1914 about 10½ million metric tons of coal; and of the coke consumed in them for the heating of retorts it is estimated that the heat from three-quarters of a million metric tons has hitherto remained unutilized. In the larger towns the waste heat of gas-works could be utilized for the treatment of kitchen refuse, and in country places for the desiccation of potatoes, turnip cuttings, leaves, &c. Being commonly owned by the local authorities, there would be no difficulty in arranging for gas-works to undertake this work: and their railway or water connections would facilitate the reception of the refuse and the delivery of the products obtained from it. The local authorities would have to enforce rigidly on householders the segregation of kitchen refuse from ashes, &c. Figures produced by a Tegel firm of engineers show that, even after the end of the war, a good return should be obtained on plant for the utilization of kitchen refuse if erected on gas-works.

# NITRE CAKE FOR SULPHATE OF AMMONIA MAKING.

The trouble with regard to price and deliveries of sulphuric acid for sulphate of ammonia manufacture has led to the suggestion that nitre cake should be substituted. The proposal was referred to by Mr. G. Stanley Cooper, B.Sc., in the paper read before the Coke-Oven Managers' Association, as published in our columns last week (p. 475). He mentioned at the same time that circulars had been issued on the subject by the Ministry of Munitions; and it was clear that Mr. Cooper is not enamoured of the substitute. The circular says that the sulphate produced by this method will contain 15·4 per cent. of sulphate of soda—thus reducing the ammonia content down to about 18 per cent.; while the free acid will be 1·4 per cent. What about bags with this acid content? Some years ago, Mr. Cooper experimented with nitre cake for this purpose; but he could never reduce the sulphate of soda down to anything like 15 per cent. He does not think that in the hands of an ordinary sulphate man anything like this figure can be attained, or continuously maintained. In further comments Mr. Cooper said: "The principal questions that arise are: (1) Can the mixed sulphate be sold? (2) How will the wear and tear of plant be affected? The first of these questions is, presumably, ignored by the Government; and the second is very lightly passed over. To my mind, it is an open question whether it is better to adopt this method or to make as much sulphate as possible by the ordinary process, and waste the rest of the ammonia, or recover it in some other form. I do not think the process is at all suitable for either direct or semi-direct plants, as to work these with the liquor at boiling-point would be highly detrimental. On the other hand, if the temperature is below boiling-point, an excessive amount of sulphate of soda is deposited. The process certainly cannot be launched into general practice in the off-hand manner which the Government circulars suggest."

The circulars referred to are as follows:

### Use of Nitre Cake in Place of Sulphuric Acid.

*Transport.*—It has been arranged for nitre cake to be delivered, for the present, free on rail at all of H.M. factories where it is produced. Manufacturers should, if possible, make their own arrangements for obtaining supplies; but the representative Committee appointed by the Ministry of Munitions to assist manufacturers in the West Riding of Yorkshire should be applied to in case of need. The Secretary of this Committee is Mr. A. Bebbington, West Riding Rivers Board, Wakefield. The Yorkshire Committee deals with supplies only for the West Riding; and manufacturers in other districts should apply to the Ministry of Munitions, Department of Explosives Supplies, Storey's Gate, London, S.W. With regard to cartage, the acid in the nitre cake will act injuriously on the woodwork, and on iron bolts in carts. These should, therefore, be protected with a coating of tar or bitumen, or be painted with silicate of soda.

*Storage.*—The cake should be stored under cover, as it is deliquescent; and any rain falling on it would yield an acid drainage, very liable to injure the foundations of walls and buildings. The floor of the storage room should be asphalted, or of stone, the joints of which are rendered in asphalte. This floor should drain to a catch-pit where any acid can be caught for use, or it should drain into the tank in which a solution is subsequently to be made. For small quantities, a lead-lined storage tank would be suitable and inexpensive.

*Handling.*—Nitre cake should be handled as little as possible, as it is very injurious to workmen's clothes and hands. If it is

necessary to handle it, the workmen's clothes should be protected by sacking, and oil or grease should be provided for the protection of their hands. Boots will be injured if the workmen constantly tread on nitre cake.

*Quantity to be Used in Place of Acid.*—As the cake contains 30 per cent. of its weight of sulphuric acid, it must be used in quantities about three times greater when being substituted for B.O.V., and about four times greater when being substituted for D.O.V.

*Sud Cracking.*—For cracking suds in order to recover grease, the best method of using the cake is to dissolve it in hot water by the aid of steam, in a wooden or cast-iron vessel, and to use this solution while still hot. If equal weights of cake and water are used in preparing this solution, it is usually only about one-sixth as strong as B.O.V.; so if it has been usual to carry the B.O.V. in buckets, it would be advisable to install a small steam-ejector to raise the solution. Such an ejector should be constructed of antimonious lead, and placed below the level of the solution, so that it may always remain charged. The pipes for conveying the solution should be of lead. For small quantities, a lead-lined wooden tank would be suitable and inexpensive for the preparation of the solution.

At works where steam is not available at the grease extraction plant, the nitre cake can be packed in the troughing leading to the seak tanks, so as to be dissolved by the suds as these flow into the tanks. If the troughs are not long enough, they can be supplemented by wooden shoots reaching nearly to the bottom of the tanks, and packed with pieces of nitre cake. The final quantities of nitre cake necessary to finish off the cracking process may be added in the form of a solution prepared as above on some part of the premises where steam is available.

### Technical Details Concerning the Substitution of Acid by Nitre Cake in Manufacturing Sulphate of Ammonia.

In those cases where the continuous process is in operation, and where the salt is fished or blown as frequently as allowable, by the operations of centrifuging, experiments have been carried out on the large scale for this department. At small works where the intermittent system is in operation, the conditions of working are at present under investigation; but there seems no reason to doubt that the process will prove equally successful in such cases also.

Nitre cake cannot be substituted for the whole of the sulphuric acid used in any of the ammonia absorption plants; but it is quite practicable to emply a solution of nitre cake admixed with acid without necessitating any alteration to the existing plant. The ammonia content of the salt is thus reduced from 25 per cent. to 18 or 20 per cent.

For commencing the operation, a solution of nitre cake is made in a lead-lined tank by the aid of steam. This solution, if made with about equal weights of water and nitre cake, will contain from 15 to 20 per cent. of sulphuric acid. It is fed into the saturator along with chamber acid in the proportion of two parts by weight of the solution and three parts of chamber acid.

The bath will now have an acidity of 40 to 50 per cent., and a density of about 86° Twaddel at 200° Fahr. But the density does not afford a satisfactory indication of the strength of the bath, which should be frequently tested by titration, and maintained at about 6 per cent. acidity by adding fresh quantities of nitre cake solution and chamber acid mixed in about equal quantities.

The first yield of salt contains a large proportion of sulphate of soda; but a salt of the required composition is soon obtained if the bath is kept at boiling point and its acidity maintained at 6 per cent. If the bath is allowed to cool, sulphate of soda separates out.

It is important that the nitre cake used should contain only a very small quantity of nitrate, since any large amount of nitric acid liberated in the saturator would have a deleterious effect upon the plant.

The salt produced contains about 18 to 20 per cent. ammonia on the wet basis. On the dry basis, the average of several analyses of the salt is:

| | |
|---|---|
| Ammonium sulphate . . . . | 83·2 per cent. |
| Sulphate of soda . . . . . | 15·4 ,, |
| Free acid . . . . . | 1·4 ,, |

By the general adoption of this process, it is estimated that 15 to 25 per cent. of the sulphuric acid now used for the production of sulphate of ammonia could be replaced by nitre cake. The amount of acid thus liberated for use in explosive works would amount to 1200 to 2000 tons of B.O.V. per week.

As ordinarily produced, 2½ tons of nitre cake contain as much acid as 1 ton of B.O.V. But owing to the lower price at which the acid in nitre cake can be bought, calculating on the basis of pure sulphuric acid, it is estimated that the process will effect a considerable saving.

**The "Scottish Gas Industry" Ambulance Car.**—We are informed by Mr. P. B. Watson, of Wishaw, the Secretary and Treasurer of the North British Association of Gas Managers, that there were 184 subscriptions (totalling £411 7s. 1d.) towards the motor ambulance car which was last month presented [*ante*, p. 301] to the Scottish Branch of the British Red Cross Society, at Glasgow. The disbursements were: Cost of motor ambulance car, £400; stationery, printing, and postage, £5 3s.; balance sent to the Red Cross Society for the Maintenance of Ambulance Cars Fund, £6 4s. 1d.

## THE NAPHTHALENE DISCUSSION AT THE MANCHESTER INSTITUTION MEETING.

It will have been noticed from the report of the discussion on Mr. Henry Simmonds's "Naphthalene" paper at the meeting of the Manchester Institution District of Gas Engineers, in last Tuesday's "Journal," that our representative failed to gather the purport of the remarks made by Mr. R. G. Shadbolt, of Grantham. On our suggestion, Mr. Shadbolt has since forwarded the following communication, which enables the omission to be made good.

Mr. Shadbolt says: "My experience with tar-washing in warm summer weather corroborated that of Mr. Leather, inasmuch as it greatly increased the naphthalene content of the gas when the temperatures of gas and tar could not be kept down. I have found relief by circulating water from a gasholder tank through the condensers; the temperature of this water in the hot weather, at a depth of 15 feet being, about 20° Fahr. lower than that on the surface. Two months' circulation only increased this temperature, at 15 feet down, by 4° Fahr. (tank 51 feet diameter, of brick, and buried in ground). I threw this out as a possible solution to those who seemed inclined to advocate dropping tar-washing in hot weather, as a means, ready to hand, in many cases. A private conversation I had with Mr. Simmonds at the close of the meeting, had reference to his estimated cost, which I pointed out to him was incorrect, as he had credited the system with the volume of 'aerated mist' at the selling price of his gas, instead of the cost price of his gas. I suggested that he should correct the cost claim in his paper accordingly; but I see he has not done so, which is a pity, as it spoils a good case."

## GAS FROM WOOD.

The "Engineering Supplement" to "The Times" mentions that wood is in more or less constant use in many of the small Australian gas-works. Only certain classes of timber are suitable for the purpose; the best being those of the box and red-gum varieties, which are intermixed with coal to the extent of about 25 per cent. By introducing the wood, it is claimed that the resulting product offers many advantages over ordinary neat coal gas, chiefly owing to the fact that naphthalene troubles are almost eliminated, while there is some considerable reduction in the amount of scurf deposited on the retorts. In Australia it is found that the average yield of gas amounts to about 12,000 cubic feet per ton of wood carbonized; but the great drawback to the method of working is the charcoal which remains behind after the completion of the distillation. It is usual to separate the charcoal from the coke, and to make use of it for heating the retort-furnaces. As employed for power purposes, wood gas is invariably manufactured from waste material such as sawdust and shavings, or even leaves; and, except for the de-tarring and washing, it is consumed in the crude form, unmixed with any other gas. Suction plants designed for using wood waste are capable of working with material of any description between dust and lumps 6 inches diameter. In general, in addition to the generator, it is necessary to instal a condenser, washer, and tar-extractor, so that all the connecting-pipes to the engine may be kept perfectly clear. The moistness of the wood has an important effect on results; and in the event of the water content being greater than 60 per cent., preliminary drying should be resorted to, otherwise difficulties will be encountered with the fire. Wood gas as obtained by distillation in gas-works has a calorific value of about 400 B.Th.U. per cubic foot; whereas the gas generated by the suction plant is approximately 160 B.Th.U. The latter figure it will be noticed is, if anything, somewhat higher than the corresponding value of the gas obtained with anthracite producers. A successful method of using wood waste is that employed in the Brooks dual scheme. The wood is primarily carbonized in retorts in the ordinary way, when a gas equivalent to about 13,000 cubic feet per ton, and having a calorific value of from 375 to 390 B.Th.U., is obtained. The resultant charcoal, which amounts to one-fifth of the original weight of the wood, is then transferred to suction producers, and the mixed gas is employed for power purposes.

**Illuminating Power of Gas.**—At a recent meeting of the Manchester Literary and Scientific Society, Dr. H. F. Coward and Mr. F. Bailey described an experiment, having for its object the ascertaining of the chief source of the illuminating power of coal gas. A stream of coal gas was passed through a tube immersed in solid carbolic acid and ether at − 79° C. This condensed completely all the benzene, toluene, and similar substances, but it allowed the whole of the ethylene to pass forward with the gas. The luminosity of the flame of the issuing gas was very feeble in comparison with that of the original gas. Measurements carried out at the Manchester Corporation Gas-Works showed that a particular coal gas lost 78 per cent. of its illuminating power by this treatment. It was claimed that the benzene hydrocarbons contribute far more to the luminosity of coal-gas flames than does ethylene, in spite of the fact that the volume of ethylene present is usually from three to five times the volume of benzene vapour.

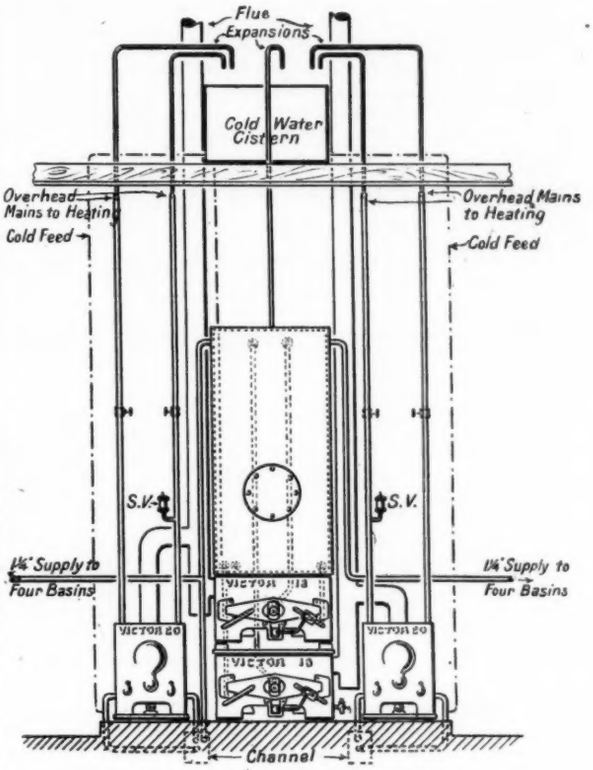
# WATER HEATING BY GAS FOR MILITARY CAMPS, MUNITION WORKERS, &c.

We are all concerned in military affairs nowadays, from recruiting, conscription, and munitions making, to work on the battlefield—and after. In the gas industry we are also deeply interested in the part that our primary and secondary products are taking in munitions making, and in promoting the comfort of the men and facilitating work in military camps, munition establishments, and other places associated with the great military system which has been brought into being through the war. Therefore, some notes on the equipment with water-heating apparatus (gas being used as the fuel) of certain accommodation centres, camps, hospitals, &c., as carried out by Mr. Thomas Potterton, of Balham, will prove of especial interest at this time. The notes show how large-scale work has been going forward in this direction of which there is nothing but local knowledge. We have in our possession the names of the localities in which the camps and other places are situated; but publication of the precise whereabouts is debarred during the war.

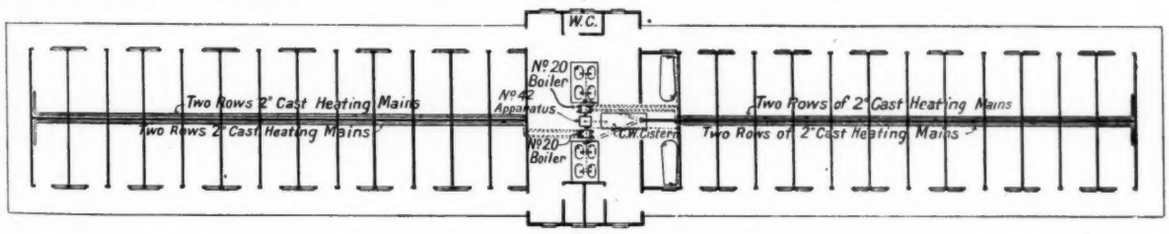
### Hot-Water Installation at a Colony of Munition Workers.

First, attention is directed to Cheshire. There on a large estate a colony is being built (under the superintendence of the Architectural Department of the Y.M.C.A.) for the accommodation of 500 munition workers who are employed by a firm of considerable importance. In all ten huts are being erected, each containing fifty cubicles for sleeping, with central lavatory and bathrooms, as shown on the plan. In each hut a plant consisting of four "Victor" gas-boilers, with the necessary storage tanks and heating-pipes, is being installed, for the dual purpose of supplying hot water to the lavatory basins and baths, and warming the sleeping cubicles.

The elevation on the drawing shows the lay-out of the boilers and storage in the centre of the lavatory, between two sets of basins. For the bath and lavatory supply, a "Victor" complete automatic hot-water apparatus (No. 42 design) is adopted, comprising two No. 13 boilers, with storage tank of 70 gallons. This apparatus is fed from a shallow cold-water cistern formed in the roof timbers, which, by proportioning the cold-water service and hot-delivery pipes, gives ample pressure at the taps, even though working on the cylinder-system, which is essential to quick and efficient results.




Elevation of Apparatus in Lavatory.


W.C.
No. 20 Boiler
No. 42 Apparatus
C.W. Cistern
No. 20 Boiler
Two Rows 2" Cast Heating Mains
Two Rows 2" Cast Heating Mains
Two Rows of 2" Cast Heating Mains
Two Rows of 2" Cast Heating Mains

Plan.

**HOT WATER SUPPLY AND HEATING INSTALLATION FOR FIFTY-CUBICLE HUT FOR THE Y.M.C.A.**

The baths are specially selected of moderate size to enable 20 gallons of water to serve for each man, and allowing for six baths being taken per hour—three in each case—the combination of boilers provided gives sufficient margin for the use of the lavatory basins, even though the demand occurs simultaneously.

Thermostatic control is provided at the boilers, to shut down the gas supply when a mean temperature of 140° Fahr. has been reached; and the two boilers in ordinary use will heat the storage to this point in one hour. The plant, being immediately adjacent to the lavatory basins, renders a secondary circulation unnecessary; while to the baths a short length of dead service is carried under the floor and carefully felted, thus reducing the secondary heat losses to the utmost extent.

For the purpose of warming the cubicles, an apparatus in two sections has been adopted; the heating surface consisting of four rows of 2-inch flow-and-return pipes carried throughout the building, about 12 inches above the floor-line. Two No. 20 "Victor" boilers are provided for working these heating mains—one for each half of the building. The connections are arranged upon the overhead system, in order to clear the gangways of the lavatory and bathrooms—the flows passing overhead near the ceiling-line; the returns being accommodated in specially formed channels in the concrete floor. The necessary air-vents are taken from the highest point of each circuit, and open-air pipes from the extreme ends of the apparatus; thus ensuring automatic action without attention to air-cocks or other means of venting.

It is anticipated that the heating of these cubicles will not be required constantly, as the men will be working alternate night and day shifts. To provide for the disconnection of any portion of the apparatus, control valves, with removable keys, are fitted in each case.

An administrative department is provided in connection with these huts for the accommodation of the male and female workers—a limited number of sleeping cubicles being provided for each—in order that those munition workers who start in the early morning, and breakfast at six o'clock, may have proper attention. A bath and lavatory are provided for each section—male and female; the hot-water supply being obtained from a No. 52 "Victor" complete apparatus worked as a local unit in each case, as the bathrooms are quite detached from any part of the colony where the other supplies exist.

The heating of the sleeping cubicles, staff sitting rooms, and offices are treated in a similar way to the munition workers' huts; being warmed by means of hot-water circulation from No. 20 "Victor" boilers.

This extensive installation therefore comprises 45 gas-boilers, ten cold supply and hot-water storage tanks, 6000 feet of 2-inch cast-mains and 2000 feet of wrought circulation; while the gas consumption for the whole plant will vary from 3600 cubic feet per hour, when the complete system is in full use, down to 250 cubic feet per hour when only half the gas-boilers for the hot-water supply are working under the thermostatic control.

### Y.M.C.A. Soldiers' Huts—Somewhere in London.

In this instance, we have huts for soldiers at a sleeping centre in London. The water-heating plant here has been arranged for the supply of three baths and eight lavatory basins in the soldiers' quarters, and three sinks for the kitchen and scullery. The apparatus comprises four No. 20 "Victor" gas-boilers, and a 150-gallon storage tank, accommodated in a chamber between the bathroom and scullery, thereby reaching all points with a short length of service without secondary circulation. The building being of the bungalow type, the cold supply can only be taken from a cistern about 10 feet above the floor. But the supply and delivery pipes are proportioned to enable the apparatus to be worked upon the cylinder system; and to assist in this the storage is designed in rectangular form, thereby working at the lowest possible level. Two of the boilers are fixed to heat the whole of the storage provided; while the remaining two are connected

with a cut-out valve, so as to be applied to the full storage or one-half of it when there is less demand for hot water.

Y.M.C.A. Soldiers' Huts—Also in London.

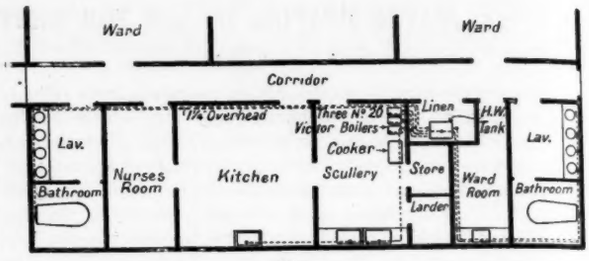
A similar plant to the one described above has been installed in this case, with three No. 20 boilers and 130-gallon cylinder for the supply of hot water to baths, sinks, and lavatories.

V.A.D. Hospital—Somewhere in Kent.

In this case, the plant, as the drawing shows, consists of three No. 20 "Victor" gas-boilers, with a 100-gallon storage tank, for the supply of hot water to two baths, eight lavatory basins, and four sinks.

The plant in this instance is designed in central form, serving the whole of the requirements as one unit; and, in the circumstances, a secondary circulation is desirable to reach approximately to the points requiring hot water. All parts of the apparatus, however, are covered, to prevent loss of heat where the emission does not answer a useful purpose. An airing-room for linen was required; and in order to provide warmth for this, the hot-water storage is fixed in the cupboard, where constant heat will thereby be maintained. Night valves are fixed on the returns of the two secondary circulations; so that, when the baths and lavatories are not in use, the long circulation necessary for the purpose can be shut off, and thus economize gas consumption.

The heating is performed by three No. 20 "Victor" boilers, burning 80 cubic feet of gas per hour each, which will heat the storage in sixty minutes under normal conditions. To provide for a reduced supply when the baths are not required, or only a small demand for hot water occurs, Potterton's cut-out valve has been adopted in connection with the hot-water storage.




Plan.

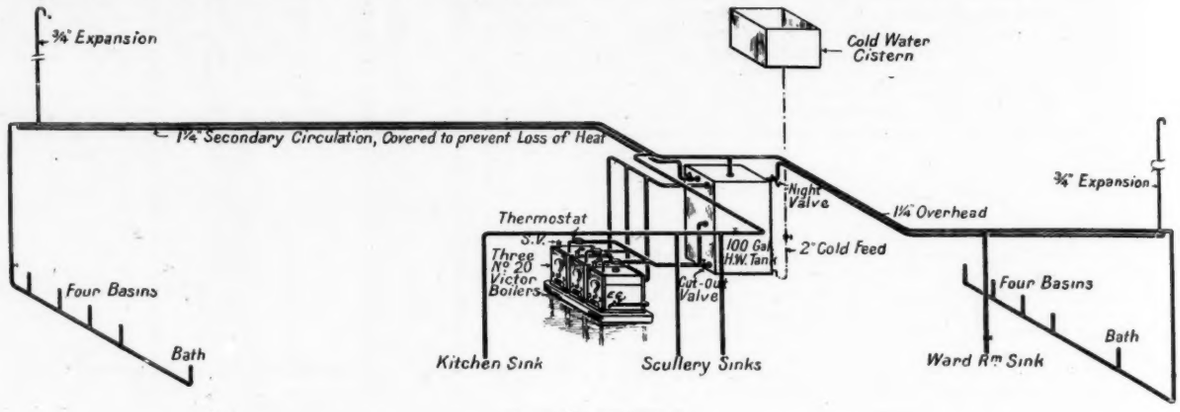
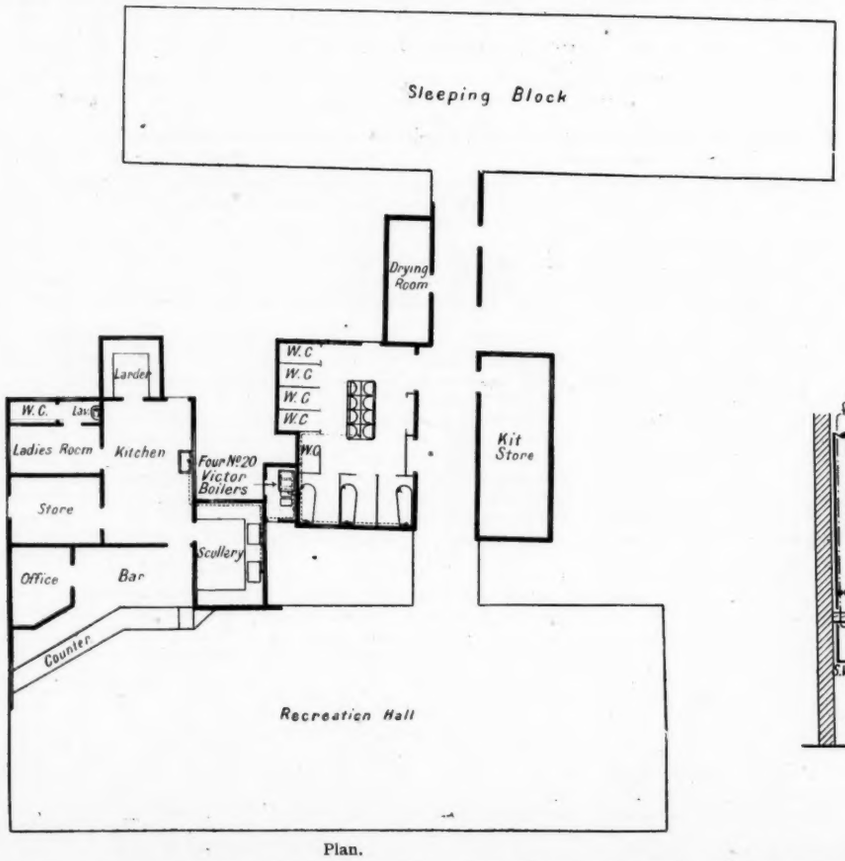



Diagram of Apparatus.

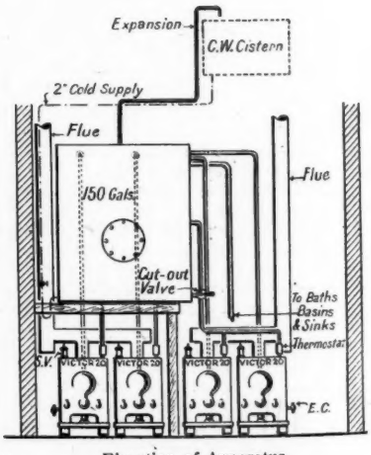
**DOMESTIC HOT-WATER SUPPLY SERVICE AT A 'V.A.D." HOSPITAL.**

Officers' Quarters at a Camp in Sussex.

Central heating plant was required in this instance to supply hot water to eight baths in addition to lavatories, kitchen, and scullery sinks, for the requirements of eighty officers resident in the camp. The baths were equally distributed throughout the




Plan.




Elevation of Apparatus.

**HOT WATER SUPPLY APPARATUS FOR A "Y.M.C.A." HUT AT A SOLDIERS' SLEEPING CENTRE.**

building to serve the cubicles in sections; and this necessitated circulations being carried a considerable length.

The plant consists of six No. 20 "Victor" gas-boilers with 300-gallon storage tank; the boilers being connected in two series of three—the one heating two-thirds of the storage capacity and the other the whole.

### Y.M.C.A. Munition Workers' Huts in Essex.

Here we have three plants for the supply of hot water to baths and lavatories, comprising No. 42 "Victor" complete apparatus, with two No. 13 boilers, and 70-gallon storage cylinders for the purpose of supplying six baths and fourteen lavatory basins.

### Y.M.C.A. Soldiers' Club in London.

A theatre has been adapted as a Soldiers' Club. In the building a "Victor" gas-heated hot-water supply apparatus originally existed for the supply of the artistes. To render the theatre suitable for the Y.M.C.A. Club purposes, three baths were required for the soldiers' use, for which the existing system was naturally inadequate. The capacity of the storage is 60 gallons; and by the addition of two No. 20 "Victor" gas-boilers to work in conjunction with the existing boiler, this storage has been retained, and is found ample for all requirements. The three boilers, working in conjunction, heat the apparatus with such rapidity that, when a succession of baths is required, there is no shortage, notwithstanding the small capacity of the storage.

For the purpose of the kitchen (which is quite remote from the baths, and is in fact on another floor), a No. 21 "Victor" complete apparatus has been fitted to supply hot water for washing-up purposes. This plant is fitted upon the "push-out" system off the existing cold-water supply, in order to avoid the necessity of long service and expansion pipes from and to the main cold-water supply cistern.

### "Third London" Hospital.

This is a large installation. Upwards of forty sets of the "Victor" complete apparatus have been adopted for the bath-rooms in the hospital wards.

Although we have particulars of other important water-heating installations that have been made by Mr. Potterton in which gas is the fuel employed, the foregoing examples suffice for showing the character of the work that has unostentatiously been going forward, in connection with the war, not only at camps, hospitals, sleeping centres, &c., but in connection with drying apparatus for munition factories and the manufacture of explosives.

## ATMOSPHERIC POLLUTION.

A supplement to the "Lancet" for Feb. 26 contained the first report of the Committee appointed for the investigation of atmospheric pollution. The report extends to forty pages, and comprises much letterpress, eighteen maps of the districts where observations have been made (with the positions of the standard gauges marked), and much tabular matter giving the results of analysis. There are fourteen members of the Committee—viz., Mr. C. J. P. Cave (Past-President of the Royal Meteorological Society), Mr. J. G. Clark, Professor J. B. Cohen, B.Sc., Ph.D., F.R.S. (Leeds University), Dr. H. A. Des Vœux (Coal Smoke Abatement Society), Dr. Hawkesley (Assistant Medical Officer of Health, Liverpool), Mr. J. B. C. Kershaw, F.I.C. (Hamburg Smoke Abatement Society), Dr. Rudolf Lessing, F.C.S., Dr. J. S. Owens (Coal Smoke Abatement Society), Dr. E. J. Russell (Director of the Rothamsted Experimental Station, Harpenden), Sir Napier Shaw, Sc.D., LL.D., F.R.S. (Director of the Meteorological Office), Chairman, Mr. E. D. Simon (Smoke Abatement League of Great Britain), Bailie W. Smith (Convener of the Air Purification Sub-Committee of the Glasgow Corporation), Mr. S. A. Vasey, F.I.C., F.C.S. (the "Lancet"), Mr. F. J. W. Whipple (Superintendent of the Instruments Division, Meteorological Office). This Committee is supplemented by several correspondents and analysts. A standard gauge was made for collecting the atmospheric impurity which falls on an exposed surface, together with that which comes down with the rainfall. With the co-operation of the authorities of nineteen cities, gauges have been installed, and provision made for analysis of collected products. They have also under consideration a filter designed by Dr. Owens to measure from hour to hour the amount of solid pollution in the atmosphere.

### What is Air Pollution?

Coming to the more material matter and the observations themselves, we have the preliminary statement that normal air may be regarded as consisting of a mixture of various gases in the following proportions:

| | Per Cent. |
|---|---|
| Oxygen | 20·94 |
| Nitrogen | 78·09 |
| Argon | 0·94 |
| Carbon dioxide | 0·03 |
| Helium, krypton, neon, &c. | Traces |
| | 100·00 |

In addition to these gases, there exists a quantity of water vapour, varying according to certain well-known physical conditions. The term "pollution" in its widest sense may be regarded as applicable to anything that disturbs the above-described constitution of the air. For instance, an excess of the watery constituent, represented by excessive rain or an abnormal quantity of carbonic acid, may be regarded as pollution. But these constituents need no further consideration. The Committee's interpretation of the term "pollution" relates to such matter, solid, liquid, or gaseous, as reaches the surface of the earth or falls upon the buildings, &c., either by its own gravity or with the assistance of falling rain.

### Solid Pollution.

The atmosphere, as we know it from everyday experience, contains suspended solid matter which cannot be regarded as a normal part of its constitution. Its significance from the physiological point of view is realized when we remember that an adult human being inhales about 400 cubic feet of air per day. Much of the solid pollution consists of combustible sooty matter; and this constituent is the source of much trouble in towns. A member of the Committee made a chemical analysis of the matter intercepted by the ventilator filters of a large institution in London, with the following results:

| | Per Cent. |
|---|---|
| Sodium chloride | Trace |
| Calcium carbonate | 2·17 |
| Ferric oxide | 2·44 |
| Calcium sulphate | 5·09 |
| Alumina | 8·34 |
| Magnesium carbonate | 0·33 |
| Sand | 37·99 |
| Carbon | 35·48 |
| Ammonium sulphate | 5·77 |
| Tar (extracted by $CS_2$) | 1·49 |
| Fibrous matter | 0·95 |
| | 100·05 |

The large proportion of free carbon in the suspended matter clearly explains the dirtying effects that are too obvious in our towns and cities; but, in addition, there are sulphates present, the effect of which on building stones is notorious. In the matter alluded to in the above analysis the sulphur takes the form of calcium sulphate, ammonium sulphate, and a very minute quantity of free sulphur; the latter probably having its origin in the oxidation of sulphuretted hydrogen evolved from the imperfect combustion of raw coal.

The following two partial analyses (made by a member of the Committee) indicate the chemical character of soot from bituminous material; in each case the fire was of the domestic type:

| | Sample No. 1. Per Cent. | | Sample No. 2. Per Cent. |
|---|---|---|---|
| $SO_3$ | 6·2 | .. | 5·8 |
| $H_2O$ | 4·4 | .. | 4·0 |
| CaO | 1·4 | .. | 2·5 |
| $Fe_2O_3$ | 2·2 | .. | 2·5 |
| Cl | 7·7 | .. | 7·9 |
| Ether extract (tar) | 28·6 | .. | 17·7 |
| $NH_3$ (combined) | 4·7 | .. | 3·8 |
| Other constituents | 44·8 | .. | 55·8 |

The matter that passes through the chimney into the atmosphere in the form of smoke would be similar in its chemical character to the soot, except that there would be in addition a considerable quantity of noxious gases and vapours. In one case the following constituents were found in the smoke passing through a chimney under which a domestic coal-fire was burning:

| | |
|---|---|
| Formaldehyde | 3·94 parts per 100,000 |
| Sulphuretted hydrogen | 51·35 " " " |
| Carbonic oxide | 1·55 " " " |

Having regard to the large volume of air that usually passes through a coal-fire chimney, these proportions are significant. The first two ingredients would probably undergo oxidation in the air, especially in the presence of sunlight. In addition to these three gaseous impurities, other gases, such as sulphur oxides and ammonia, together with carbonic acid, were present in very large quantities, but were not estimated. There can be little doubt that similar results obtain when coal is imperfectly burned in steam-boilers, or in works where coal is used for purposes other than steam-raising.

### Vaporous and Gaseous Pollution—Innocuous Gaseous Methods of Heating.

The vapours to which the attention of the Committee has been given were the tarry hydrocarbons. This tarry matter attaches itself to the carbon particles and gives them very great adhesive power, so that when they have deposited on, and attached themselves to, building stones, plant, &c., they cannot be readily washed away by rain, as would be the case if the tar were not there.

The gaseous pollutions kept in mind by the Committee were the sulphur oxides and ammonia. Coal contains on the average about 1 per cent. of its weight of sulphur (say, 20 to 30 lbs. for each ton of coal). Under conditions of perfect combustion, this sulphur would be evolved as either di-oxide or tri-oxide of sulphur or both. But if the combustion is not perfect, sulphuretted hydrogen appears—in fact, it is probably always safe to assume that when

visible smoke is evolved from coal, sulphuretted hydrogen accompanies it.

The Committee recognize that during recent years many thousands of smoke-producing coal-fires have been supplanted by gas cooking and heating stoves, and, still more recently, the electric stove has been introduced. The products of combustion from a gas-fire consist mainly of carbonic acid and water vapour, together with a minute quantity of sulphur oxides. There is a total absence of those tarry and carbonaceous substances that are produced by the use of raw coal; and as the sulphur is so exceedingly small in amount, the gaseous method of heating is comparatively innocuous. As regards heating capacity, a coal-fire consuming 21 lbs. of coal per day would be about equal to a gas-fire consuming 200 cubic feet of gas per day; but whereas the coal would evolve about 1500 grains of sulphur in various forms, as well as the tar, carbon, &c., already alluded to, the gas would contribute only 50 to 60 grains of sulphur in the form of sulphur oxides. Electric stoves do not evolve products of combustion; and therefore their use also tends to a cleaner air.

Apart from the polluting effect of the 20 to 30 lbs. of sulphur for each ton of coal consumed, it is regrettable that this valuable material should be wasted. Its total amount must be huge. The Committee recognize that much of this waste of material is avoided when coal is utilized in gas-works.

### A Sample Table.

The methods of work pursued are next explained, and then the standard gauge is described, and instructions follow. Succeeding are the maps and tables—referring to Birmingham, Bolton, Exeter, Kingston-upon-Hull, Liverpool, London, Malvern, Manchester, Newcastle-on-Tyne, Oldham, Sheffield, York, Coatbridge, Greenock, Leith, Paisley, and Stirling. This is a really representative geographical collection of places for the observations. One out of three tables for Birmingham will give an idea of the extensive character of the work involved, and the value of the whole of the data to those who are concerned in atmospheric pollution, and its reduction by the adoption of non-smoke producing means of heating.

deal with the acids and salts dissolved in the rain water which are included in the products of combustion of coal. The loss on ignition is due to the soluble organic matter, ammonia salts, and carbonates of the alkaline earths. The sulphuric acid referred to is included in the soluble portion. The chlorine may get into the atmosphere in the form of chloride of sodium from the spray of sea water. Ammonia is produced with tar by destructive distillation in the combustion of coal and decay of animal refuse.

### Comparisons.

Commenting on an extensive table showing the monthly means of the several elements of pollution, the Committee note (among much else) that in Manchester the School of Technology, with six months' record, gives the same results as the University, not far away, with only one. Davyhulme and Fallowfield are similar, except that Davyhulme gets the better mark for tar. Fallowfield and Moss Side are similar, except that there are more of the soluble constituents and acids at Moss Side. Similarly, Bowdon makes a very exemplary record, but gives way to Malvern, particularly in the matter of acids. Birmingham Central is almost identical with Sheffield (Attercliffe); but Birmingham has more sulphuric acid in its air and Sheffield much more chlorine. Leith and York run entirely together, until the ammonia column is reached. Tar and other carbonaceous matter do not follow one another very closely. The insoluble ash is relatively prominent at Liverpool, the Meteorological Office, and Wandsworth Common, but relatively inconspicuous at Embankment Gardens, Southwark Park, Golden Lane, in Central Manchester (School of Technology and University), Newcastle-on-Tyne, Paisley, and Stirling. This deposit includes wind carried dust, and is therefore a good deal dependent on the exposure of the gauge. Sulphuric acid is generally in the same proportion as the total solids; the agreement is quite striking. The exceptions are Bolton, London (Victoria Park), Manchester (Whitefield), comparatively richer in acid, Newcastle-upon-Tyne, Oldham, Sheffield (Attercliffe), and Paisley comparatively poorer. Chlorine is rather more irregular, and is relatively conspicuous by its presence at the Meteorological Office, Sheffield (at Attercliffe and Meerbrook Park), Greenock, and Paisley.

Birmingham (Central).

| — | Rainfall in Millimetres. | Metric Tons per Square Kilometre. | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Insoluble Matter. | | | Soluble Matter. | | Total Solids. | Included in Soluble Matter. | | |
| | | Tar. | Carbonaceous other than Tar. | Ash. | Loss on Ignition. | Ash. | | Sulphate as ($SO_4$). | Chlorine (Cl). | Ammonia ($NH_3$). |
| 1914. | | | | | | | | | | |
| May | 35·60 | 0·18 | 4·79 | 15·92 | 1·71 | 7·26 | 29·86 | 2·93 | 1·57 | 0·48 |
| June | 54·36 | 0·2 | 4·48 | 11 76 | 1·96 | 4·7 | 23·1 | 2·36 | 1·20 | 1·36 |
| July | 99·0 | 0·20 | 4·80 | 12·20 | 1·40 | 5·70 | 24·30 | 2 60 | 0·80 | 0 20 |
| August | 55·0 | 0·10 | 2·50 | 7·50 | 0 90 | 3·20 | 14·20 | 1·70 | 0·30 | 0·10 |
| September | 22 | 0·10 | 2·80 | 8·50 | 1·30 | 3·40 | 16·10 | 2·10 | 0 20 | 0·10 |
| October | 39 | 0·12 | 4·36 | 12·37 | 1 54 | 4·81 | 23·20 | 2·72 | 0·31 | 0·09 |
| November | 86 | 0·11 | 4 17 | 10 05 | 1·47 | 6·30 | 22·10 | 3·66 | 0·52 | 0·05 |
| December | 158 | 0·56 | 5 36 | 15 42 | 2·53 | 10·42 | 34·29 | 5·52 | 1·10 | 0·13 |
| 1915. | | | | | | | | | | |
| January | 72 | 0·15 | 5 29 | 13·16 | 2·70 | 7·00 | 28·30 | 4·40 | 0·60 | 0·04 |
| February | 89 | 0·19 | 3·04 | 7·57 | 1·60 | 5·80 | 18·20 | 3 60 | 0·60 | 0·07 |
| March | 20 | 0·12 | 3·90 | 12·38 | 1·30 | 4·20 | 21·90 | 2·60 | 0·40 | 0·03 |
| Total | 729·96 | 2·03 | 45 49 | 126·83 | 18 41 | 61·79 | 255·55 | 34 25 | 7·60 | 2 65 |
| Monthly mean | 66·36 | 0·18 | 4·14 | 11·53 | 1·67 | 5·71 | 23·23 | 3 11 | 0·69 | 0·24 |

### Elements of Atmospheric Impurity.

In this first report upon such an intricate and elaborate investigation, the Committee say it is too much to hope that the figures are entirely devoid of error. The analysis of atmospheric pollution has necessarily been guided by the facilities of chemical analysis to separate the different constituents of atmospheric impurity. The elements evolved are:

(1) Tar and other carbon compounds soluble in carbon bisulphide.
(2) Carbonaceous matter which is not soluble in that reagent.
(3) Ash which is included in the residue after the first filtration.
(4) Loss on ignition—*i.e.*, the volatile and combustible parts of the compounds dissolved in the rain water.
(5) Residual ash from these compounds—after the ignition.

These five together make up the total solids collected in the gauge. A separate estimate is made of the amount of sulphates as $SO_4$, of chlorides as Cl, and of ammonia as $NH_3$.

With reference to these elements, it may be noted: (1) The tar in the atmosphere is produced by the imperfect combustion of coal or wood and, recently, by the introduction of the practice of tarring roads; (2) the carbonaceous matter other than tar may consist of coal dust or of unconsumed carbon carried into the atmosphere by draughts through fires, also any fragments of animal or vegetable matter, animal refuse, pollen, and blown seeds; (3) the insoluble ash includes the dust of mineral origin carried from roads or open country by the wind; and (4) and (5)

### The Ordinary Air we Breathe.

It is therefore interesting to observe that the average atmosphere may be expected to deposit upon a square kilometre in any one winter month 15 tons of solid matter, which may be regarded as made up of 0·15 ton of tarry matter, 3 tons of carbonaceous matter other than tar, 6 tons of insoluble inorganic dust, besides soluble salts, which include 3 tons of sulphuric acid, 1 ton of chlorine, and 0·3 ton of ammonia. Taking 250 acres to the square kilometre, 1 ton per square kilometre works out at rather less than 1 cwt. to 12½ acres, or 9 lbs. per acre.

### Relation of Pollution to the Seasons.

At the end of the report the question is considered of the relation between the various elements of atmospheric pollution and the season of the year. It was expected beforehand that there would be a relation, because the products of pollution by domestic fires is one of the most noteworthy characteristics of the colder seasons. Several tables follow. A seasonal variation with a maximum in winter and a minimum in summer is clearly disclosed in the summary for total solids. The same characteristic is emphasized in soluble ash and even more so in sulphuric acid; and to a less extent also in loss on ignition and also in tar. Spring is the most productive of grit; summer and winter are equal in this respect; and autumn is least. Carbonaceous matter other than tar (smuts and fragments of plants) shows no discrimination between the seasons. Ammonia is the only one which shows itself as a summer product.

# THE EVOLUTION OF THE MODERN CHARGING AND DISCHARGING MACHINE.

By H. C. Widlake, M.J.Inst.E., of the Plymouth and Stonehouse Gaslight and Coke Company.

[*Continued from p.* 463.]

## Type and Rating of Motors.

The motors used on the machines referred to in last week's article are usually of the series-wound type; and, so far as their characteristics are concerned, are identical with the motors used on street tramway systems. Automatic speed regulation is not essential to the successful operation of these machines (with the exception of the case of projector machines), while the high initial torque which the series-wound motor is capable of exerting renders it a particularly suitable machine for the handling of loads possessing a considerable degree of inertia which has to be overcome. Some makers favour the practice of adding a sufficient number of shunt turns to a standard series machine to keep down the light load speed to reasonable limits; but in view of the fact that the operator has perfect control over the speeds of all his motions, it is doubtful whether this practice confers sufficient benefits to warrant the extra expense and the increased electrical complication.

These motors are invariably rated upon an intermittent basis—that is to say, upon a basis which takes into account those periods during which the motor is standing idle, and in which, as a consequence, it has plenty of time to cool. Broadly speaking, where a motor is run constantly for periods of two or three hours it should be rated upon a continuous basis; but for any lesser periods, and for work in which a perfectly regular periodicity or degree of intermittency exists between the idle and the working periods of the motor, the machine may be rated upon the intermittent basis. This rating is expressed as a fraction of a percentage existing between a given time and the period in that given time during which the motor is working at or near full load. For example, a crane-lifting motor may be working at full load for one minute and then standing for two minutes while the suspended load is being handled by the slewing or travelling motors. In such a case the intermittency factor of this motor would be one-third, or 33 per cent., if we take no account of the lowering time, when in any case the motor would be very lightly loaded. This factor may also be expressed as the output at which a motor will work for one hour with a given rise of temperature.

For discharging and travelling on a retort charging or discharging machine using separate motors, the motors employed on these motions will have a higher rating than that used on the lowering-hoisting motion; while in the case of a single-motor machine, it is obvious that a continuous rated motor should be employed if the stoking machine is to be used continuously, as the idle intervals of the motor will be much too short to warrant the use of an intermittent rated machine.

The following table shows the horse power and the speeds at which a "KA 7" type motor, manufactured by the British Thomson Houston Company, of Rugby, will operate on a 220 volt circuit for a quarter, half, and one hour duty with temperature rises of 40°, 50°, 60°, and 70° C.:

| Rating. | Horse Power. | Speed R.P.M. | Temperature Rise. | |
|---|---|---|---|---|
| | | | C. | Fahr. |
| Quarter hour | 12·5 | 480 | 40 | 72 |
| " " | 14·0 | 450 | 50 | 90 |
| Half hour | 10·3 | 545 | 40 | 72 |
| " " | 11·5 | 510 | 50 | 90 |
| " " | 12·5 | 490 | 60 | 108 |
| " " | 13·5 | 465 | 70 | 126 |
| One hour | 8·0 | 635 | 40 | 72 |
| " " | 9·0 | 585 | 50 | 90 |
| " " | 9·8 | 560 | 60 | 108 |
| " " | 10·5 | 540 | 70 | 126 |

The momentary overloads of which this machine will be capable of handling in excess of the normal rating expressed on the above basis will be as follows:

| Temperature Rise after Run at Normal Rating. | | Momentary Overload. | | |
|---|---|---|---|---|
| | | Quarter Hour Duty. | Half Hour Duty. | One Hour Duty. |
| C. | Fahr. | Per Cent. | Per Cent. | Per Cent. |
| 40 | 72 | 75 | 100 | 100 |
| 50 | 90 | 75 | 100 | 100 |
| 60 | 108 | — | 75 | 100 |
| 70 | 126 | — | 75 | 100 |

The machines to which these figures refer are particularly suited for this class of work, and are made in eight sizes by the British Thomson Houston Company. The following table gives the various capacities and speeds of these eight sizes, based on a temperature rise of 40° (72° Fahr.), after runs of quarter hour, half hour, and one hour durations on a 220 volt circuit:

| — | B.H.P. Quarter Hour. | R.P.M. Quarter Hour. | B.H.P. Half Hour. | R.P.M. Half Hour. | B.H.P. One Hour. | R.P.M. One Hour. |
|---|---|---|---|---|---|---|
| K.A. 4 | 3·9 | 600 | 3·1 | 700 | 2·4 | 850 |
| K.A. 5 | 5·9 | 540 | 5·1 | 610 | 4·3 | 670 |
| K.A. 6 | 7·8 | 520 | 6·7 | 560 | 5·6 | 620 |
| K.A. 7 | 12·5 | 480 | 10·3 | 545 | 8·0 | 635 |
| K.A. 8 | 20·3 | 505 | 16·1 | 565 | 13·4 | 625 |
| K.A. 9 | 24·0 | 450 | 20·6 | 485 | 17·0 | 525 |
| K.A. 10 | 34·3 | 495 | 28·6 | 530 | 23·2 | 585 |
| K.A. 11 | 56·0 | 460 | 45·0 | 520 | 36·0 | 565 |

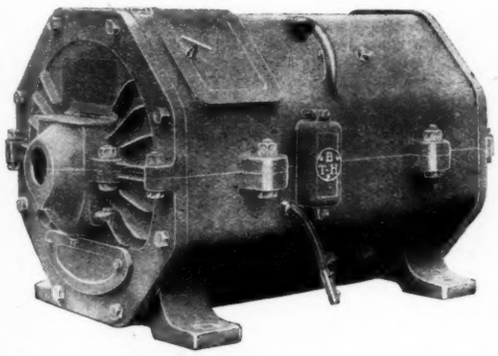


Fig. 1.—British Thomson-Houston Company's "K.A." Type Crane Motor.

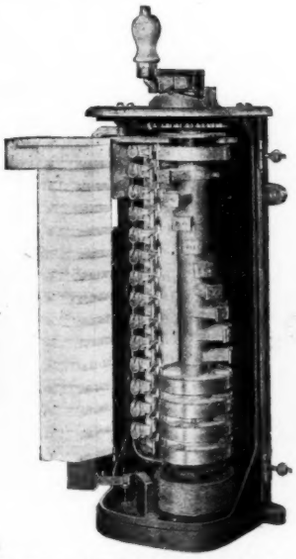


Fig. 2.—Typical Stoking Machine Controller by the B.T.H. Company.

Fig. 3.—Typical Stoking Machine Resistance Unit by the British Thomson-Houston Company.

A "K.A." type motor, with its controller and resistance is shown in figs. 1, 2, and 3. The motor is designed for crane and hoist work, and is of robust construction and neat appearance. The traverse dimensions of the machine have been kept as small as is consistent with good design, in order to facilitate the arrangement of gearing, &c. In the smaller sizes, the motor carcase is one casting; but in the larger machines this frame is split on the horizontal axis, as shown in fig. 4. In all sizes the end shields are ribbed, both internally and externally, in order to provide large radiating surfaces, and are so fitted to the frame as to permit of their being turned through angles of 45°, 90°, or 180°; thus allowing the motor to be fixed on the floor, ceiling, wall, or

sloping bulkhead. The bearings, the length of which is two-and-a-half times their diameter, are of low-friction bearing metal, and are lubricated by loose rings running on the shaft and dipping into large oil wells.

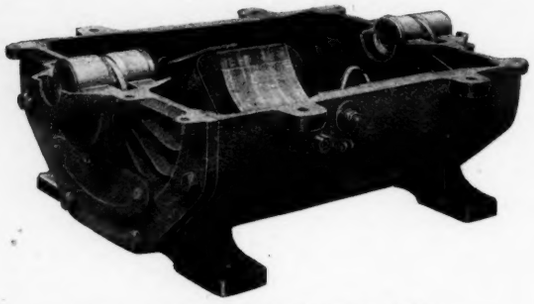


Fig. 4.—Lower Half "K.A." Type Crane Motor.

The armature is shown in fig. 5, and the brush holder in fig. 6, from which it will be seen that, following the standard tramway practice, the armature is so wound as to permit of commutation

Fig. 5.—Armature of "K.A." Type Crane Motor.

Fig. 6.—Brush Holder and Brushes, "K.A." Type Crane Motor.

being effected by one pair of brushes situated in the most accessible position in the motor—that is to say, under the top inspection lids.

### Coupling.

Where the power is transmitted from the armature shaft by means of spur or chain gearing, a comparatively large degree of misalignment would have to take place before the efficiency of the drive would be seriously impaired or the elements of the transmission damaged. But where the armature shaft is coupled direct to a worm or other gear box by means of the usual solid cast-iron coupling, the slightest degree of misalignment or distortion will result in a bending strain on both shafts, and will ultimately lead to either broken shafts or serious damage to their ends at the seatings of the respective couplings.

In the absence of a cast-iron combination bed-plate, there is a strong case for the employment of a flexible coupling, of which there are many excellent types on the market. The use of certain of these would greatly facilitate the work of changing the motor; the task of engaging their respective elements being much easier than the lining-up of the faces of a solid coupling, particularly if the member of the machine frame on which the motor and gear box are fitted happens to have been sprung. The use of a flexible coupling in such a case would enable the power to be transmitted between the motor and gear box without any destructive effect or loss of efficiency, even though a considerable degree of misalignment existed.

### Gearing.

On a two, three, or four motor machine most of the gearing employed, extraneous to the actual motions, will be that which is necessary to bring the speed of the armature down to the figure at which it can be applied to the motion to which the motor is coupled; and this is usually performed in one stage by means of a worm and wheel enclosed in a cast-iron casing. It is the usual practice to use phosphor bronze worm wheels and hardened steel worms; while the end thrust, due to the worm, is taken by thrust bearings of ball or multiple plate type—the latter, in the author's opinion, being the best. These end-thrust bearings fulfil a most important function; and worm boxes should be watched closely for any signs of end-play in the worm shaft.

If, due to breakage or wear, the thrust bearings fail to fulfil their purpose, the duty of taking the thrust will fall upon the bearings of the motor to which the worm is coupled, with the result that, every time the worm takes up its drive, the armature shaft will be moved rapidly along its longitudinal axis until the end-play collars come into violent contact with the bearing bushes. These bushes cannot stand such collisions for long, and will soon be shifted in the end-bearing shields, in which, normally, they will be secured by keep studs or screws. When this has happened there is nothing to prevent the armature brushes coming into collision with the increased diameter of the armature behind its commutator.

In this connection, the writer might say that the worst breakdown in his experience was caused by the failure of a worm box end thrust bearing in this manner. In the plant under his charge the possibility of a recurrence of this trouble is guarded against by the provision of a gun-metal collar between the inner end of

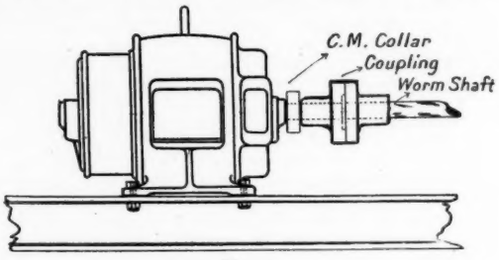



Fig. 7.

the half coupling on the armature shaft and the end bearing shield, as shown in fig. 7. With this arrangement a little end play—say, $\frac{3}{16}$-inch—is allowed; but should the thrust plates in the worm box fail, the blow given in the manner described upon the worm taking up its drive will be delivered to the entire motor, which, with its heavy carcase, will not come to any harm in the short time between the failure of the plates and the hammering action, which will call the operator's attention to the fact that there is something very wrong.

In connection with the raising-lowering motion, a worm box is to be favoured, on account of the self-locking characteristics which may be obtained by the use of a suitably-designed worm. It is admitted that a worm can only be designed for the purpose of holding its load by a sacrifice in efficiency; but the service of this motion is of a very intermittent character indeed, so that this diminution in mechanical efficiency is of very little importance, while the safeguard which the practice affords cannot, in reality, be overestimated.

Forged and cast steel spur gearing is used for some reductions on certain machines; and the efficiency and life of such drives can be greatly increased by the provision of cast-iron or sheet-steel gear-boxes, forming heavy oil-baths in which the whole of the gearing runs.

For high speeds, and for services where the teeth of the gears must withstand heavy and frequent shocks, raw hide or compressed paper pinions are applicable. For some time the writer has used a pinion of this type on a travelling motor; and while the wear on this pinion is greater than would be the case with a cast-steel pinion, the large and expensive spur wheel with which it gears shows no sign of wear after being in continuous operation for 2½ years. In this pinion the weaker material is reinforced by bronze end-plates riveted through the pinion. There would seem to be a field for such pinions for this class of work; it being well known that the decrease of strength with increasing velocity in an all metal gear train is due to the effect of impact.

### Wiring.

It is essential, if freedom from electrical troubles is aimed at, that the wiring between the various electrical appliances should be carried out with the same degree of care as is expended upon the purely mechanical elements of the machine. With both stoking machines and telpher installations indifferent work in this respect—very often entrusted to the same fitter who puts up the machine—results in making an otherwise good machine a "bag of trouble" till a man who knows his work comes along and puts things right only after everyone connected with the plant has received a bad impression of the new machine. In the earlier machines, these arrangements were too often relegated to a back seat; and good machines, good motors, and controlling apparatus were ruined by the iniquitous manner in which the wiring was carried out.

The whole of the wiring should be carried in heavy gauge screwed steel conduit, and securely fixed to the various members of the machine frame. The manufacture of conduits and fittings for this purpose has reached a high degree of perfection, and suitable fittings can be easily and cheaply obtained, and the most awkward corners and circuit lay-out negotiated wtthout exposing the cables at any point. These remarks apply with equal force to the small lighting circuits, which should be protected by good iron-

clad fuse-boxes fitted as close as possible to the source of electrical supply, and provided with removable fuse carriers.

STANDARDIZATION.

The load factor in respect to the motor used for operating the lowering-raising gear is much less than the corresponding factors of the discharging, charging, and travelling motors; and this motor is rated accordingly, just as the slewing motor of a crane is often rated on a quarter-hour duty basis. In regard, however, to the travelling and stoking motors, the difference in their respective load factors is not sufficiently great in some stoking machines as to warrant these motors being rated on a different basis, and in some cases these machines, with their controllers and their resistances, are interchangeable, both mechanically and electrically. This practice may sometimes lead to the provision of a larger travelling motor than is absolutely necessary. It must be remembered, however, that these motors come in for a lot of rough usage; and liberality of rating in this respect is a good point (unless, of course, it is carried to extremes), as the maximum power which a motor, however liberally rated, can exert may be limited by the setting of the circuit-breaker. Another advantage of standardization in this connection is that it enables the stock of necessary controller and motor spares to be much less than would be required if the two motors were of a different type. Any design that tends in the direction of standardization should find favour, always provided that efficiency is not sacrificed nor initial cost appreciably increased in the effort to obtain a high degree of standardization and interchangeability.

*(To be concluded.)*

# DETERMINATION OF TOLUENE

## WITH A NOTE ON THE APPLICATION OF THE METHOD TO BENZENE AND XYLENE.

By HUGH W. JAMES, A.R.C.Sc. (Lond.).

**[A Communication to the "Journal of the Society of Chemical Industry," Feb. 29.]**

The following method of determining toluene was devised in view of the extended nature of the Government requirement for coal-tar distillates. It is hoped that the method may prove useful to those manufacturers and chemists whose work may necessitate the use of a rapid and accurate test.

The results given in Part II. have been found of considerable assistance in following the progressive changes in composition of the distillates obtained from benzol stills that are employed in the production of pure benzene and pure toluene.

DETERMINATION IN NAPHTHAS.

The specification is divided into two parts. The object of Part I. is, by means of a fractional distillation, to obtain two fractions (I. and II.), of which the former is substantially a mixture of toluene and benzene, and the latter a mixture of toluene and xylenes. In Part II. each of these fractions is submitted to a rapid distillation, from the results of which the percentage of toluene in each case can be determined by reference to the tables provided.

A sample of one pint of the naphtha should be available. The top of the thermometer bulb should be ½-inch below the side tube of the flask or column. The thermometers used must be correct, or their error known. Barometric correction should be made on the basis of 0·1° for each 0·1 inch above or below the standard. A round-bottom flask should be employed, as the fractions can then be distilled to a small residue.

### Part I.

In which the naphtha is submitted to a series of three distillations, referred to as stages A, B, and C. A fractionating column is necessary for all these distillations; one or other of the following being recommended: Le Bel-Henninger, 6 bulbs; Young's "rod and disc," 20 discs; Young's "pear" still-head, 12 bulbs; Young and Thomas's "evaporator" still-head.

Each stage—whether A, B, or C—should be started with a clean and dry flask, column, and condenser. The rate of distillation is to be maintained throughout at one drop per second from the end of the condenser. If the column is of such type that it retains liquid when in an upright position, it should be drained (by inverting or otherwise) into receiver No. 6 at the end of stages B and C.

PROCEDURE.

A. Distil 250 c.c. to 140° C. A preliminary distillation of 100 c.c. may be made. If at least 95 per cent. distils below 140° C., distillation A is dispensed with, and the original 250 c.c. is at once submitted to B.

B. Redistil the distillate obtained in A (or the original sample), collecting fractions in receivers numbered as under: 1. Below 90° C. 2. 90° to 100°. 3. 100° to 109°. 4. 109° to 112°. 5. 112° to 120°. 6. Residue at 120° C.

C. Redistil the fractions 2, 3, 4, and 5 separately, receiving all the liquid that distils below 110·6° C. in each case in receiver No. 1, and adding all residues that remain undistilled in each case at 110·6° to that in receiver No. 6.

If on redistilling No. 2 the residue in the flask becomes so small that distillation must be stopped before 110·6° C. is reached, the flask is allowed to cool. Fraction No. 3 is then added to the residue of No. 2, and the distillation continued. If the distillation of No. 3 or of No. 4 has similarly to be stopped before 110·6°, the same procedure is to be followed; No. 4 being added to the residue of No. 3, and No. 5 to the residue of No. 4.

EXCEPTIONS.

*No. 1.—Crude Unwashed Naphtha.*

If a crude unwashed naphtha is under examination, it must be distilled to 150° in stage A. The distillate is washed with sulphuric acid in the usual way, and is then submitted to B; the following fractions being collected: 1. Below 90°. 2. 90° to 100°. 3. 100° to 109°. 4. 109° to 112°. 5. 112° to 120°. 6. 120° to 140° C. In stage C, all the above fractions are separately distilled to 110·6° into No. 1; and all the residues at that temperature are poured, when cold, into a vessel No. 7.

*No. 2.—Commercial Benzol or Toluol.*

If a commercial benzol or toluol is under examination, it is at once submitted to B, as in this case stage A is not required.

### Part II.

The sample now having been separated into three fractions—namely: No. I. Distillate obtained below 110·6°, in vessel No. 1; No. II. Distillate from 110·6° to 140°, in vessel No. 6 (or 7); No. III. Residue at 140°, which, if any, is discarded, proceed as follows:

Nos. I. and II. are measured, and the volumes corrected for loss due to the film of liquid remaining in the several receivers used in each case. The amount of this loss must be determined. This may be done by pouring a known volume of benzol or toluol from a graduated measure into each receiver; agitating it in order completely to moisten the interior of the vessel; and subsequently draining the liquid back into the measure, noting the loss in volume.

PRECAUTIONS RELATIVE TO PART II.

Before distilling, the flask and condenser tube should be moistened with the fraction to be distilled in each case, and allowed to drain. After distillation, and when cool, the residue is drained into the measure containing the distillate, and any loss added to the observed volume of distillate. The graduated vessel used in measuring out the liquid should be employed, without drying, for collection of the distillate.

The flask used should have a neck about 5 inches long, with side tube at about the middle of the neck; and the bulb should be of about 150 to 180 c.c. capacity.

PROCEDURE.

*No. I. Fraction.*—This fraction (or 100 c.c., if there be sufficient of it) is distilled from a distillation flask, with side tube in the neck, at the rate of two drops per second. The distillation is stopped at 85°, 90°, 95°, 100°, and 108° C.; the total percentage of distillate, if any, at each temperature being noted. It will be found that one of the readings will be within, or very near, the range of one of the columns in Table I., from which the percentage of toluene in Fraction I. can be interpolated.

The distillation is finished when the total percentage of distillate at one of the above temperatures falls within the range of the corresponding column in Table I.

*No. II. Fraction.*—This is similarly treated; the distillation being stopped at 115°, 120°, 125°, 130°, and 137° C., and the total percentage of distillate again noted for each temperature. Reference is then made to Table II.

From the resulting figures the total toluene in each Fraction I. and II. is calculated, and the sum of these is the toluene in the original 250 c.c. of naphtha.

The following particulars of a commercial benzol illustrate the procedure: *Fraction I.* 234 c.c. giving 83 per cent. distillate at 85° C. Reference to Table I., column 1, indicates that it contains approximately 9 per cent. toluene = 21·1 c.c. *Fraction II.* 15 c.c. giving distillates as under: 115°, 27 per cent.; 120°, 57 per cent.; 125°, 65 per cent.; 130°, 78 per cent. Reference to Table II., column 2, shows that a distillate of 57 per cent. at 120° represents approximately 69 per cent. toluene = 10·3 c.c.; total toluene, 31·4 c.c.; toluene in original sample $\frac{31{\cdot}4}{250} \times 100 = 12{\cdot}6$ per cent.

The method is available for determination of toluene in crude coal-tar naphtha; in the light oils resulting from the scrubbing of coal gas and of coke-oven gas; in commercial benzol, toluol, and solvent naphtha; also for the determination of toluene in "motor benzol" to which solvent naphtha has already been added. The time required for carrying out a test averages about 3½ hours.

TRIAL OF VARIOUS MIXTURES OF BENZENE, TOLUENE, AND XYLENES.

The percentage of toluene indicated by the preceding test is placed against the known percentage of toluene in each case in the table [p. 532].

Considerable experience and practice with the above method have shown that, for naphthas containing not less than 30 per cent. of toluene, the amount of error should not reach 1 per cent. In the case of naphthas containing less than 30 per cent., the error may reach, or slightly exceed, 1 per cent. The indications are

| No. | Benzene. Per Cent. | Toluene. Per Cent. | Xylenes. Per Cent. | Heavy Naphtha and Creosote. Per Cent. | Toluene Indicated by Test. Per Cent. |
|---|---|---|---|---|---|
| 1 | 86 | 12 | 2 | — | 12 6 |
| 2 | 20 | 65 | 15 | — | 65·2 |
| 3 | 3 | 15 | 82 | — | 16·0 |
| 4 | 47 | 3 | 50 | — | 5·2 |
| 5 | 5 | 90 | 5 | — | 89 6 |
| 6 | 18 | 8 | 18 | 56 | 7·0 |
| 7 | 50 | 0 | 50 | — | 3·0 |

unsatisfactory only when toluene is absent, or present in small quantity. A more rigorous fractionation in the first part of the test would reduce this error; but it would be unwise to make the method more complicated and more lengthy in order to deal with such cases.

A course of procedure for naphthas of low toluene content would be to carry out the determination on a mixture consisting of 40 per cent. of pure toluene and 60 per cent. of the naphtha under examination. The results, after allowing for the added toluene, will then be satisfactory.

### Correction for Paraffinoid Hydrocarbons.

Paraffinoid hydrocarbons are detected by a specific gravity determination, which should be made on Fraction II. at 15·5° C. The specific gravity of this fraction should lie between ·865 and ·870, as the toluene obtainable from such a naphtha would include, at most, only traces of paraffins, and would have a specific gravity above ·868, and thus be of a quality suitable for those purposes for which pure toluene is required.

In the actual determination of the paraffins, it may be taken that the "pure" toluene obtainable from a naphtha would contain 1 per cent. of paraffinoid hydrocarbons for every ·002 by which the specific gravity of Fraction No. II. at 15·5° C. falls short of ·867.

For example, a naphtha shows, on analysis, 74·0 per cent. of toluene. The specific gravity of Fraction No. II. is ·861—that is, ·006 below ·867. The "pure" toluene from this naphtha would contain 3 per cent. of paraffins. To correct the indicated per cent. of toluene for this, subtract from it 3 per cent. of its total, thus: $74 \times 0{\cdot}03 = 2{\cdot}2$ (approximately). Toluene in the sample $= 74{\cdot}0 - 2{\cdot}2 = 71{\cdot}8$ per cent.

### Determination in Coal Tar.

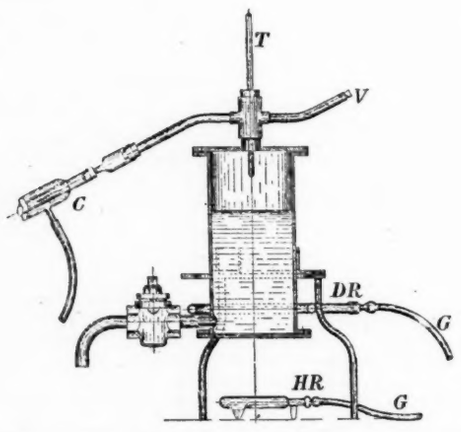
For the purpose of determining the toluene in coal tar it is necessary to separate the crude naphtha from the tar by fractional distillation, and to wash this naphtha (which contains the whole of the toluene) with sulphuric acid before applying the test described above.

Sufficient of the tar is distilled to yield at least 250 c.c. of crude naphtha. Generally, 8000 c.c. of tar will be found ample. Some tars, however, contain so much naphtha that 4000 c.c., or even less, may be based.

**Part I.**

### Distillation of the Tar.

The tar is placed in a glass retort or an iron still—preferably the latter. A convenient and easily constructed still is shown in the diagram.




T. Thermometer. V. Cork loosely inserted to act as a safety valve. C. Water-cooled condenser. GG. Gas supplies. HR. Ring-burner for preliminary heating. DR. Ring-burner employed as additional source of heat when water has been distilled off.

**Tar Still for Laboratory Use.**

A thermometer is fitted in such a position that the bulb is surrounded by the vapour in the still. The delivery-pipe of the still is connected to a water-cooled condenser. Distillation is then started. The distillate is collected in a receiver which, when the

**Table I.** — Mixtures of Toluene and Benzene.

| Toluene Per Cent. | 85° | 90° | 95° | 100° | 108° |
|---|---|---|---|---|---|
| 3 | 98·2 | | | | |
| 4 | 94·5 | | | | |
| 5 | 91·0 | | | | |
| 6 | 89·2 | | | | |
| 7 | 87·0 | | | | |
| 8 | 85·0 | | | | |
| 9 | 82·6 | | | | |
| 10 | 80·0 | | | | |
| 11 | 77·0 | | | | |
| 12 | 74·2 | | | | |
| 13 | 71 0 | | | | |
| 14 | 68·0 | | | | |
| 15 | 64·0 | | | | |
| 16 | 60·0 | | | | |
| 17 | 56·2 | | | | |
| 18 | 52·4 | | | | |
| 19 | 48·0 | | | | |
| 20 | 42·5 | | | | |
| 21 | 37·0 | | | | |
| 22 | 32·0 | | | | |
| 23 | 28·0 | | | | |
| 24 | 23·0 | | | | |
| 25 | 17·0 | 71·3 | | | |
| 26 | | 69·5 | | | |
| 27 | | 67·2 | | | |
| 28 | | 65·0 | | | |
| 29 | | 63·0 | | | |
| 30 | | 60·7 | | | |
| 31 | | 58·0 | | | |
| 32 | | 55·6 | | | |
| 33 | | 53·0 | | | |
| 34 | | 50·5 | | | |
| 35 | | 48·0 | | | |
| 36 | | 45·0 | | | |
| 37 | | 42·1 | | | |
| 38 | | 39·5 | | | |
| 39 | | 35·5 | | | |
| 40 | | 33·2 | | | |
| 41 | | 30·0 | | | |
| 42 | | 26·8 | | | |
| 43 | | 23·2 | | | |
| 44 | | 19·5 | | | |
| 45 | | 16·0 | 57·0 | | |
| 46 | | | 55·3 | | |
| 47 | | | 53·5 | | |
| 48 | | | 51·5 | | |
| 49 | | | 49·5 | | |
| 50 | | | 47·2 | | |
| 51 | | | 44·9 | | |
| 52 | | | 43·0 | | |
| 53 | | | 40·2 | | |
| 54 | | | 38·0 | | |
| 55 | | | 35·2 | | |
| 56 | | | 32·8 | | |
| 57 | | | 30·5 | | |
| 58 | | | 28·0 | | |
| 59 | | | 25·0 | | |
| 60 | | | 22·0 | 56·5 | |
| 61 | | | | 54·5 | |
| 62 | | | | 52·3 | |
| 63 | | | | 50·1 | |
| 64 | | | | 47 9 | |
| 65 | | | | 45·6 | |
| 66 | | | | 43·2 | |
| 67 | | | | 40·8 | |
| 68 | | | | 38·2 | |
| 69 | | | | 35·7 | |
| 70 | | | | 33 0 | |
| 71 | | | | 30·0 | |
| 72 | | | | 27·0 | |
| 73 | | | | 24·0 | |
| 74 | | | | 21·0 | |
| 75 | | | | 18·0 | 76·0 |
| 76 | | | | | 75·0 |
| 77 | | | | | 73·9 |
| 78 | | | | | 72·6 |
| 79 | | | | | 71·3 |
| 80 | | | | | 70·0 |
| 81 | | | | | 68·4 |
| 82 | | | | | 66·8 |
| 83 | | | | | 65·0 |
| 84 | | | | | 63·0 |
| 85 | | | | | 60·8 |
| 86 | | | | | 58·2 |
| 87 | | | | | 55·9 |
| 88 | | | | | 52·5 |
| 89 | | | | | 49 1 |
| 90 | | | | | 45·0 |
| 91 | | | | | 40·0 |
| 92 | | | | | 35·0 |
| 93 | | | | | 29·0 |
| 94 | | | | | 21·0 |
| 95 | | | | | 11·0 |
| 96 | | | | | 6·0 |
| 97 | | | | | 3·0 |

**Table II.** — Mixtures of Toluene and Xylenes.

| Toluene Per Cent. | 115° | 120° | 125° | 130° | 137° |
|---|---|---|---|---|---|
| 3 | | | | | 4·0 |
| 4 | | | | | 6·5 |
| 5 | | | | | 11·0 |
| 6 | | | | | 17·0 |
| 7 | | | | | 23·0 |
| 8 | | | | | 28·0 |
| 9 | | | | | 32·3 |
| 10 | | | | | 37·0 |
| 11 | | | | | 41·0 |
| 12 | | | | | 45·0 |
| 13 | | | | | 48·5 |
| 14 | | | | | 51·2 |
| 15 | | | | | 53·5 |
| 16 | | | | | 55·8 |
| 17 | | | | | 58·0 |
| 18 | | | | | 59 8 |
| 19 | | | | | 61·5 |
| 20 | | | | | 63·3 |
| 21 | | | | | 65·0 |
| 22 | | | | | 66·4 |
| 23 | | | | | 67·8 |
| 24 | | | | | 69·2 |
| 25 | | | | 21·7 | 70·5 |
| 26 | | | | 24·7 | |
| 27 | | | | 27·5 | |
| 28 | | | | 30 3 | |
| 29 | | | | 33·0 | |
| 30 | | | | 35·7 | |
| 31 | | | | 38·2 | |
| 32 | | | | 40·7 | |
| 33 | | | | 43·1 | |
| 34 | | | | 45·4 | |
| 35 | | | | 47·6 | |
| 36 | | | | 49 8 | |
| 37 | | | | 51·8 | |
| 38 | | | | 53·5 | |
| 39 | | | | 55·3 | |
| 40 | | | | 57·2 | |
| 41 | | | | 59·0 | |
| 42 | | | | 60·7 | |
| 43 | | | | 62 3 | |
| 44 | | | | 63·8 | |
| 45 | | | 36·3 | 65·3 | |
| 46 | | | 38·8 | | |
| 47 | | | 41·2 | | |
| 48 | | | 43·4 | | |
| 49 | | | 45·7 | | |
| 50 | | | 48·0 | | |
| 51 | | | 50·2 | | |
| 52 | | | 52·3 | | |
| 53 | | | 54·5 | | |
| 54 | | | 56·6 | | |
| 55 | | 17·0 | 58·6 | | |
| 56 | | 20·0 | | | |
| 57 | | 23·5 | | | |
| 58 | | 26·5 | | | |
| 59 | | 29·5 | | | |
| 60 | | 32·7 | | | |
| 61 | | 35·7 | | | |
| 62 | | 38·7 | | | |
| 63 | | 41·5 | | | |
| 64 | | 44·0 | | | |
| 65 | | 46·7 | | | |
| 66 | | 49·5 | | | |
| 67 | | 52·1 | | | |
| 68 | | 54·9 | | | |
| 69 | | 57·2 | | | |
| 70 | | 59·6 | | | |
| 71 | | 62·0 | | | |
| 72 | | 64·5 | | | |
| 73 | | 67·0 | | | |
| 74 | | 69·4 | | | |
| 75 | | 71·6 | | | |
| 76 | | 73·7 | | | |
| 77 | | 75·7 | | | |
| 78 | | 77·5 | | | |
| 79 | | 79·2 | | | |
| 80 | 41·5 | 80·9 | | | |
| 81 | 46·0 | | | | |
| 82 | 50·0 | | | | |
| 83 | 54·0 | | | | |
| 84 | 58·0 | | | | |
| 85 | 62·0 | | | | |
| 86 | 66·0 | | | | |
| 87 | 70·0 | | | | |
| 88 | 73·5 | | | | |
| 89 | 76·3 | | | | |
| 90 | 79·3 | | | | |
| 91 | 82·2 | | | | |
| 92 | 85·0 | | | | |
| 93 | 87·7 | | | | |
| 94 | 90·4 | | | | |
| 95 | 93·0 | | | | |
| 96 | 95·5 | | | | |
| 97 | 98·0 | | | | |

thermometer indicates 220° C., is removed and a second receiver substituted for it. When this change of receivers is made, the supply of water to the condenser is shut off. The distillate is collected in the second receiver until the thermometer indicates 260° C., at which point the distillation is stopped.

During the time that the distillate is being collected in the first receiver, a sample, amounting to two or three drops of the distillate, should be taken periodically, and allowed to fall upon the surface of cold water contained in a beaker or other suitable vessel. When one of these samples becomes partly or wholly solid, the water supply to the condenser is shut off, and the water remaining in the condenser is allowed to become warm. The water supply is shut off in any case, as stated above, when the change of receivers is effected. This is done so as to avoid the risk of blockage by naphthalene, which would be dangerous.

From the foregoing procedure two fractions are obtained: (*a*) Light oil and water up to 220° C.; (*b*) creosote oil, 220° to 260° C.

**Part II.**

DISTILLATION OF THE PRODUCTS OBTAINED IN PART I.

For this purpose a fractionating column is employed. A strip of cotton material is wound round the column in such a manner as completely to cover it except the side tube and the portion that projects within the neck of the flask containing the product to be distilled. This prevents the formation of too much liquid by undue condensation in the column. The top of the thermometer bulb should be ½-inch below the side tube of the column.

The light oil is separated from the water and is then distilled to 190° C. The water is measured. The creosote oil is similarly distilled to 190°. The distillate from the creosote oil is now added to that obtained from the light oil, and the mixture is thoroughly shaken. If any water settles out, it is separated and measured. The total quantity of water obtained from the tar is noted.

The mixture of distillates obtained from the light oil and the creosote oil now constitutes the crude naphtha of the tar. The crude naphtha is measured; and 250 c.c. is distilled to 150° C., and treated as described in "The Determination in Naphthas." [*Vide* "Exception No. 1" *ante.*]

The following are particulars of an actual determination: Tar taken, 7000 c.c.; less water, 300 c.c.; tar (anhydrous), 6700 c.c. Yield of crude naphtha, 400 c.c.

DETERMINATION OF TOLUENE IN THE CRUDE NAPHTHA.

Distillate to 150° (prior to washing with acid), 106 c.c.; loss on washing with acid, 8 c.c.; washed distillate = 98 c.c.

*Fraction I.*—49 c.c., giving 35 per cent. distillate at 85° C. Reference to Table I, column 1, indicates that it contains 21·4 per cent. toluene = 10·5 per cent.

*Fraction II.*—29 c.c., giving 43 per cent. distillate at 120° C. Reference to Table II., column 2, indicates that it contains 63·6 per cent. toluene = 18·4 c.c. Toluene in 250 c.c. of naphtha, 28·9 c.c. The total amount of toluene in the 400 c.c. of naphtha, and, of course, in the tar from which this naphtha was distilled, is $\frac{28{\cdot}9 \times 400}{250} = 46{\cdot}2$ c.c. The amount of toluene in the anhydrous tar is, therefore, $\frac{46{\cdot}2 \times 100}{6700} = 0{\cdot}69$ per cent.

Assuming that 1 ton of coal yields 10 gallons of anhydrous tar, and taking the weight of 1 gallon of toluene as 8·7 lbs., the amount of toluene obtained per ton of coal carbonized will be 0·069 × 8·7 = 0·60 lb.

DETERMINATION OF BENZENE.

No. I Fraction, Part II., contains the benzene present in the original naphtha; and, consequently, its amount can be approximately ascertained by subtraction from the total volume of this fraction of the amount of toluene it contains. As determined in this manner, the figure found will include any carbon bisulphide and thiophen present.

DETERMINATION OF XYLOL (SOLVENT NAPHTHA).

The determination of the xylenes by fractional distillation is not satisfactory, owing to the probable presence of ethylbenzene and other hydrocarbons. For the approximate estimation of xylol (solvent naphtha) the following procedure, in the case of a crude naphtha, will demonstrate the method. Distil the naphtha to 190° C. (through a column), wash the distillate with sulphuric acid, &c., and submit the washed naphtha to stage A of the toluene determination (*vide* "Exception No. 1—Crude Naphtha"), collecting, however, an additional fraction distilling between 150° and 170° C. The amount of xylol will then be found by adding together the following three quantities: (*a*) The fraction obtained in stage A between 150° and 170°; (*b*) the fraction obtained in stage B between 140° and 150°; (*c*) the difference between the quantity of toluene in Fraction II. and the total of that fraction.

APPLICATION TO WORKS PRACTICE.

In the case of benzol stills employed in the production of pure benzene and pure toluene, the distillate obtained between the two pure products, though it may contain very small amounts of xylenes, &c., may be regarded practically as a mixture of toluene and benzene; also, the distillate that follows after pure toluene has ceased to appear may be regarded practically as a mixture of toluene and xylenes. Consequently, by submitting 100 c.c. of the run of the still to distillation as described in Part II. of the method for the determination in naphthas, and by subsequent reference to the tables given, the composition of the distillate at any moment can be revealed, and thus the course of the distillation can be intelligently followed.

This simple test can be performed by the stillman himself with very little practice, and it can be accomplished in a few minutes. It is hardly necessary to lay stress on the advantage of knowing exactly what a still is doing at any moment.

NOTE ON THE WASHING OF NAPHTHA WITH SULPHURIC ACID.

The naphtha is shaken with 10 per cent. of its volume of concentrated sulphuric acid for ten minutes in a separating funnel. [The mixture of acid and naphtha frequently becomes so hot that partial sulphonation of the latter occurs. To obviate this as far as possible, the separator containing the mixture should be immediately immersed in cold water, and shaken under the surface of the water until the contents no longer tend to become hot.] The separator is allowed to stand for half-an-hour for settlement of the brown "acid tar." This is then run off and 50 c.c. of water is poured in, but not agitated with the naphtha. When complete separation has occurred, the water is drawn off, and similar washings of water are poured in, without shaking, until they are free from opalescence. The naphtha is then, and then only, shaken gently with further successive washings of water until these no longer show opalescence. Then 10 c.c. of a clear solution of caustic soda (sp. gr. 1·075) is run in and shaken with the naphtha, and drawn off, after complete separation. [If the solution of caustic soda is not entirely free from suspended solid matter, difficulty will probably be experienced in effecting a separation from the naphtha.] Finally, the naphtha is shaken with two washings of water, each of 50 c.c., which are drawn off to the last drop.

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**London and Southern District Junior Gas Association.**—Next Saturday members will visit the Lower Sydenham works of the South Suburban Gas Company; and on Friday, the 24th inst., there will be a meeting at the Westminster Technical Institute, at which Mr. E. W. L. Nicol, the Engineer and Fuel Expert to the London Coke Committee, will deliver an address on "Coke Fuel for Steam-Boilers."

**Tar Oils for Diesel Engines.**—In an article on Diesel engines in the "Times Engineering Supplement," the writer refers to the researches of Mr. Charles Day, who, he says, in a recent contribution to the proceedings of the Diesel Engine Users' Association, indicated that tar-oils suitable for use in engines of this type were obtainable not only from gas-works, but from coke-ovens, blast-furnaces, and certain gas-producers. As to gas-works, tar resulting from distillation in horizontal retorts did not prove altogether desirable, owing to the percentage of free carbon; but vertical retorts were found to yield a tar in every way serviceable.

**Southern District Association of Gas Engineers.**—At the annual meeting, on Thursday of next week, at the Hotel Cecil, the new President (Mr. W. Doig Gibb) will deliver his Inaugural Address; and thereafter two papers which were prepared for the November meeting (but held over through lack of time to consider them) will be read and discussed. One of these is on the "Construction of Concrete Purifiers at Romford in 1913," by Mr. W. D. Child; and the other is a "Short Description of the Carbonizing Plant at Southampton, and Results Compared with Previous Years," by Mr. F. Durkin. The chair will be taken at 2.30; and after the meeting tea will be served—the annual dinner having been abandoned, owing to the war.

**Centenary of the Exeter Gas Company.**—The Exeter Gaslight and Coke Company (a report of whose annual meeting appears in another column) will celebrate its centenary next month, having been incorporated in April, 1816. An article dealing with the early history of gas supply in Devonshire appeared in the "JOURNAL" for April 20 last year [p. 161]; so that now it need merely be mentioned that, as early as April 10, 1815, it is recorded that the shop of Alderman Philip, in Fore Street, was lit with gas. By October 1816, pipes had been laid down through the central thoroughfare of the city as far as Paris Street, and by July, 1817, it was announced that the whole of the Fore Street had been lighted with gas for several nights. In 1841 the gas made was 13 million cubic feet, and sold at 9s. 6d. per 1000 cubic feet; in 1865, 84 millions, at 4s. 2d.; 1878, 161 millions, at 4s. 2d.; and in 1915, 452 millions, at 2s. 10d.

**Trading with Enemies.**—A Royal Proclamation dated Feb. 29, called the Trading with the Enemy (Neutral Countries) Proclamation, 1916, sets forth that: "All persons or bodies of persons, incorporated or unincorporated, resident, carrying on business, or being in the United Kingdom, are hereby prohibited from trading with any of the persons or bodies of persons mentioned in the list hereunder written, which list, with such variations therein or additions thereto as may be made by any Order made by the Lords of the Council on the recommendation of a Secretary of State under the power in that behalf given by section 1, subsection (2) of the Trading with the Enemy (Extension of Powers) Act, 1915, shall be called the 'Statutory List.'" Among the large number of names included in this Statutory List are to be found: Brasch and Rothenstein, 320, Amsterdam, and Boompjas 40A, Rotterdam; the "Metropol" Gasgloeilichtfabriek (Gloeikousjesfabrik), Parkstraat 15, Arnhem; "Monopol" Gasgloeilichtfabriek, 487 Prinsengracht, Amsterdam; J. Norden, Stationsweg 43, Rotterdam; and the Gaswerk, Santa Cruz, Tenerife.

## EFFECT ON THE SIDES OF A GASHOLDER BELL OF A ONE-SIDED LOAD ON THE CROWN.

The following is a summary of the contents of a communication on this subject to the "Journal für Gasbeleuchtung" of Oct. 16 last by Herr Schmidt, an Engineer attached to a firm of gasholder builders at Dortmund.

If the diagonal stiffening inside the bell walls is wanting, any panel bounded by two adjacent vertical posts can become distorted to such an extent that the side sheets lose their curvature in the direction of one diagonal, and a double fold is formed in the direction of the other diagonal. The distortion or obliquity of the whole side walls which is thereby produced can be determined mathematically, as the author proceeds to show by reference to figs. 1, 2, and 3. The section through the side of the

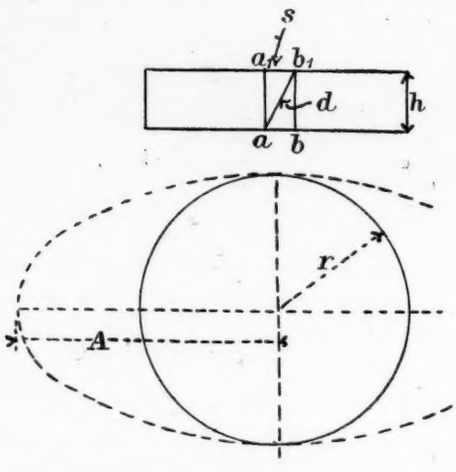



Fig. 1.

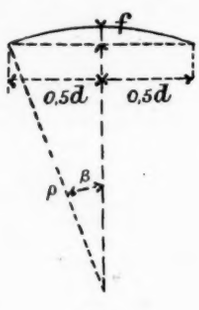



Fig. 2.

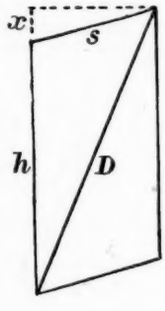



Fig. 3.

holder along the diagonal $a\ b_1$ is an arc of an ellipse of which the depth or pitch $f$ equals the chord $a\ b = s$ of the circle of radius $r$, and A is half of the major axis, and $\rho$ the radius of curvature on the arc $a\ b_1$ of this ellipse. Then the expression for the right angle $x$ (fig. 3) is found to be:

$$(1) \qquad x = \frac{2\pi^4 r^2}{3n^4 h}$$

in which $n$ is the number of vertical props in the whole circuit of the bell. Then the total distortion or obliquity (S) of the walls of the bell, being equal to $0{\cdot}5\ n\ x$, we have:

$$(2) \qquad S = \frac{\pi^4}{3n^3}\left(\frac{r^2}{h}\right).$$

When the holder is telescopic, the average diameter of all the lifts must be taken for the value of $r$ in this equation.

With such a distortion of the whole bell, there will be an overbalancing, or overweighting, of the water in the cups. With measurements expressed in metres, the moment ($M_t$) in tonne-metres of this overweighting for the horizontal central axis of the bell will be [*vide* fig. 4] for one cup only:

$$(3) \qquad M_t = \frac{4}{3}\left(\frac{\pi}{n}\right)\frac{br^4}{h}.$$

And for a number ($m$) of cups:

$$(4) \qquad mM = m\,\frac{4}{3}\left(\frac{\pi}{n}\right)^3\frac{br^4}{h}.$$

Snow gives the most unfavourable one-sided loading of the crown, as it may cause turning in the same direction as the wind acting on the sides. Wind pressure on the crown may be ignored [see fig. 5]. The moment, $M_s$, of the one-sided snow-pressure is, according to the formula given in the German standard rules

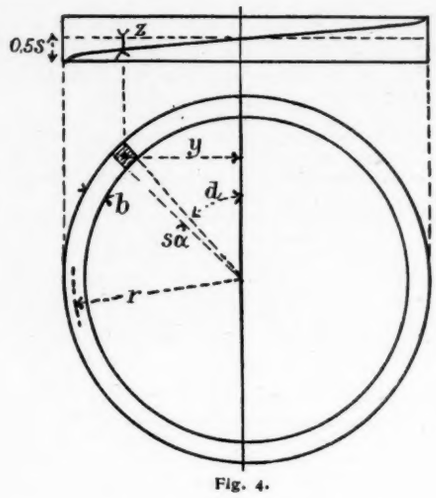



Fig. 4.

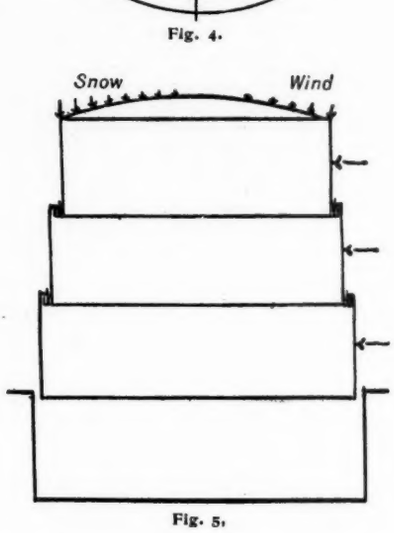



Fig. 5.

for gasholder construction, in tonne-metres: $0{\cdot}001 \times r^2\,\pi \times 20 \times 0{\cdot}424\ r = 0{\cdot}00848\ \pi\ r^3$. The ratio of $M_t$ to it is therefore:

$$(5) \qquad \frac{mM_t}{M_s} = \frac{1551\ mbr}{n^3 h}.$$

Examples show that the distortion or obliquity S is comparatively small with large gasholders; and there is therefore no danger in omitting diagonal stiffening from the upper lift of such holders, especially when the vertical props are riveted to the side sheets. When this riveting is omitted, any diagonal stiffening would only serve to increase the lateral resistance to breaking strain of the vertical props. As even the thin side sheets, in conjunction with the vertical props, give an effective diagonal tieing of the sides of the bell, the result is great resistance of the latter to a one-sided load on the crown. Hence with a telescopic holder raised to its highest position, it may be assumed that only the highest and lowest rings of the bell afford resistance to this load by horizontal forces H [fig. 6] which can readily be determined.

This determination of S also serves for calculating the margin of safety of the seal of a cup of a certain size. If the cup has the proportions shown in fig. 7, in which $p$ signifies the maximum pressure thrown by the bell, S must not exceed a certain figure, if the cup—notwithstanding the obliquity—is to afford security against the water flowing over the rim $a$, or gas escaping under the dip-plate $b$. This figure is given by the equation $S + c = p$, in which $c$ may be taken as about equal to 0·05 metre [nearly 2 inches]. The value of $p$, expressed in metres, is then:

$$(6) \qquad p = c + \frac{\pi^4 r^2}{3n^3 h}$$

There is risk of overflow when $n$ is small, or when the capacity of the bell is low. With large holders there is little risk of this; but the strain on the material resulting from the distortion caused in the sides by one-sided pressure of snow must be determined. This will be seen from fig. 6 to be greatest when only the top lift of the bell is raised, as H then has its greatest value.

One example given by the author is: Taking $r = 20$ metres [65·6 feet]; $h = 10$ metres [32·8 feet]; $b = 0{\cdot}26$ metre [10¼ inches]; $p = 0{\cdot}24$ metre [9½ inches]; $n = 32$; and $m = 3$ metres [9·84 feet]. Then by equation (5), it is found that $M = 213$ tonne-metres, and $M_s + m\,M_t = 228{\cdot}8$ tonne-metres. With the topmost lift only in use, $H = \frac{M_s}{10} = 21{\cdot}3$ metric tons. The maximum horizontal force which can come on a panel between two adjacent verticals is 1·331 metric tons, and the greatest diagonal strain occurring in the side walls of the bell is 3·637 metric tons.

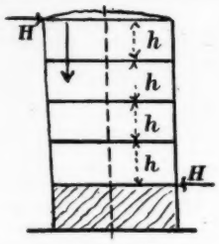



Fig. 6.

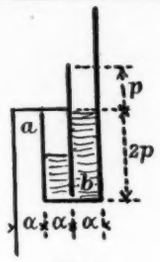



Fig. 7.

If the side sheets are 0·23 centimetre [0·09 inch] in thickness, and 0·9 metric ton is a safe strain, then a width of 17·5 centimetres [6·9 inches] will take up the diagonal strain. Conversely, the least safe height of the sides of the bell may be calculated by equation (6) to be 2·08 metres [6·82 feet]. But since $h$ has been taken as equal to 10 metres, it follows that there is no risk of the water running over the cups. The moment of the cup water is 15·76 tonne-metres, and S is 39 mm. [1·54 inches]. The effective capacity of the holder is 51,000 cubic metres [1,800,000 cubic feet].

In a second example, the author takes $r = 10$ metres [32·8 feet] ; $p = 0{\cdot}15$ metre [5·9 inches] ; $b = 0{\cdot}2$ metre [7·9 inches], and $n = 16$. With $c = 0{\cdot}05$ metre [nearly 2 inches], the least safe height of the sides of the bell is found by equation (6) to be 7·9 metres [25·9 feet]. The capacity of this holder with two lifts is 175,000 cubic feet. The maximum permissible ratio $\frac{2r}{h}$ then becomes $= \frac{20}{7{\cdot}9}$ = about 2·5. The moment of a one-sided load of snow attains 26·63 tonne-metres; and as $n = 16$, with the top lift cupped, H is equal to $\frac{26{\cdot}63}{7{\cdot}9} = 3{\cdot}37$ metric tons, and $s = \frac{20\ \pi}{16} = 3{\cdot}93$ metres [12·9 feet]. Hence

$$d = \sqrt{7{\cdot}9^2 + 3{\cdot}93^2} = 8{\cdot}82\ ;\ \text{and}\ \frac{d}{s} = 2{\cdot}24.$$

Then as the greatest diagonal tensional strain in the side sheets is $\frac{3{\cdot}37}{8} \times 2{\cdot}24 = 0{\cdot}943$ metric tons, the thickness of the sheets may be 0·2 centimetre [0·079 inch] and the width of a strip of the side sheeting which will take up this strain becomes $\frac{0{\cdot}943}{0{\cdot}2 \times 0{\cdot}9} =$ 5·2 centimetres [2·05 inches], which is considerably less than in the first example. S here is equal to $\frac{97{\cdot}4}{3 \times 16^3} \times \frac{100}{7{\cdot}9} = 0{\cdot}10$ metre [3·94 inches], and the moment of the cup water is found to be 2·55 tonne-metres and the ratio $\frac{M_1}{M} = \frac{2{\cdot}55}{26{\cdot}63} = 0{\cdot}095$. Since S in this case is comparatively large, it is desirable, with small gasholders, that the side walls should be stayed or stiffened internally—having regard to the considerable deformation which would otherwise occur—in order to ensure the sides remaining gas-tight.

**Society of British Gas Industries.**—We learn from the Secretary (Mr. Arthur L. Griffith) that the annual general meeting of the Society will be held at the Trocadero Restaurant, Piccadilly Circus, W., on Wednesday, the 29th inst., and the annual dinner will take place the same evening.

**New Lighting Order for London.**—A fresh lighting order, of still stricter provisions than its predecessors, will come into force in the Metropolitan Police District on Friday. Among other things, it states that in shops lights must be screened to prevent any escape of direct light, or lights reflected from mirrors, &c. In all private houses and premises not otherwise provided for, unless the lights are adequately shaded at their source, light coloured blinds or curtains are no longer permissible. The order will take effect during the remainder of March from 6.30 p.m. until sunrise; during April, from 7.30 ; during May, from 8 o'clock ; during June, and until a further order is made, from 9 o'clock to sunrise.

**Calorific Value Standard in Massachusetts.**—The Massachusetts Gas and Electric Light Commission have, according to the "American Gaslight Journal," recommended a Bill to the Legislature which would empower the Board from time to time to determine how many British thermal units shall be required of gas supplied by companies and municipal plants to their customers—in no event to be less than 550 B.Th.U. Thereafter, if the company, town, or city shall be found on three consecutive inspections, or within thirty days, to be supplying gas below the established calorific standard (unless such defect is unavoidable) a fine of $100 may be imposed. The Bill provides that, in connection with inquiries made by the Board under the above provision, it may suspend the operation of the law as to a candle power of gas for periods not exceeding nine months. It also provides that every gas company or municipal plant distributing more than 15 million cubic feet a year shall, when required by the Board, provide and maintain a suitable room, not less than ¼-mile from the gas-works, with a calorimeter of approved type, for the use of the State inspectors.

## EFFECT OF ALTITUDE ON GAS-ENGINES.

The issue of "Gas Age" (New York) for the 15th ult., quotes from the "Journal of Electricity, Power, and Gas" some observations on this subject by Mr. J. E. Megson.

The author writes: Due to the reduced density—that is, the weight per cubic foot of the atmosphere at higher altitudes—the amount of oxygen drawn into an engine-cylinder is lessened ; and therefore the quantity of fuel with which it will combine and burn is relatively decreased. Consequently a gas-engine will not develop as much power at a higher elevation as it will at lower altitudes. For altitudes less than 500 feet above sea-level, no reduction in horse-power or alteration of fuel consumption need be contemplated ; but at higher elevations a reduction in horse-power is necessary in accordance with the accompanying table :

TABLE OF ALTITUDES IN FEET ABOVE SEA LEVEL ;
*with Corresponding Approximate Barometric Readings, Atmospheric Pressures, and Proportionate Densities.*

[The capacity of an internal combustion engine at higher altitudes, as compared with its capacity at sea-level, is practically proportional to the atmospheric densities.]

| Altitude in Feet. | Barometer in Inches. | Atmospheric Pressure. Pounds per Square Inch. | Proportionate Atmospheric Density. |
|---|---|---|---|
| 0·00 | 30·0 | 14·72 | 1·00 |
| 500·00 | 29·5 | 14·45 | 0·98 |
| 1,000·00 | 28·9 | 14·18 | 0·96 |
| 1,500·00 | 28·4 | 13·94 | 0·94 |
| 2,000·00 | 27·9 | 13 69 | 0·93 |
| 2,500·00 | 27·4 | 13·45 | 0·91 |
| 3,000·00 | 26·9 | 13·20 | 0 89 |
| 4,000·00 | 26·0 | 12·75 | 0·86 |
| 5,000·00 | 25·1 | 12·30 | 0·83 |
| 6,000·00 | 24·2 | 11·85 | 0·80 |
| 7,000·00 | 23·3 | 11·44 | 0·77 |
| 8,000·00 | 22·5 | 11·04 | 0·75 |
| 9,000·00 | 21·7 | 10·65 | 0·73 |
| 10,000·00 | 20·9 | 10·26 | 0·70 |

The table shows the height of the barometer in inches and the equivalent density of the atmosphere. The horse-power output of the engine will be proportionate to the equivalent density—that is, a 500 H.P. engine at sea-level, at 5000 feet elevation will be 500 × 0·83, or 415 H.P. The fuel consumption of this engine, however, must also be revised ; an addition of 1 per cent. or fraction thereof being made for each 1000 feet elevation.

The capacity of the cylinder also definitely limits the output of an internal combustion cylinder at any altitude, as the combustion of the fuel depends entirely upon the amount of oxygen in the cylinder—a certain amount of oxygen giving complete combustion to a certain amount of fuel oil, which, in turn, develops a certain amount of power. Ordinarily internal combustion engines are rated at 10 per cent. below their ultimate capacity ; and it is dangerous and uneconomical, the author points out, to operate the engines at a greater load than is specified by the manufacturers, although this may be possible for short intervals.

## Employment and the Munitions of War Acts.

The very large amount of special legislation which has been brought about with such lightning-like rapidity, under the stress of an altogether unpreconceived state of affairs, has created doubts in the minds of many people as to exactly how they stand in one respect or another. With an exceptionally abundant crop of new rules, regulations, "musts," and "must-nots" to master, and far less opportunity than usual to master them, the layman has naturally been forced to turn to the expert for guidance; and the expert has not been found wanting. Several examples of the readiness of those who have studied this emergency legislation to share with others the knowledge gained by them have been quoted in our pages; and now attention has been called to a further instance, by the receipt of a book on "Employers and Workmen under the Munitions of War Acts, 1915 and 1916," compiled by Sheriff Fyfe, of Glasgow, and published at 2s. 6d. net by Messrs. William Hodge and Co., of No. 12, Bank Street, Edinburgh. The author's position as Chairman of the Glasgow Munitions Tribunal has afforded him ample facility for becoming familiar with the Acts and the questions most likely to arise under them; and he has utilized his experience in describing in plain language what the Acts really mean, and what penalties they impose. There is an appendix in which the provisions of the Amending Act are fitted into their places in the original Act—the amendments being printed in red. Two other appendices are also included; one containing the rules for arriving at the excess profits in controlled establishments, the other the rules as to dismissal of workmen, clearance certificates, &c. A good index is provided to the book; and glancing through it, one is forcibly struck by the number of references under the heading of "Penalties." With so many possibilities of pecuniary loss as are here revealed, it is evident that the half-crown required for purchase might very soon be saved by a perusal of Sheriff Fyfe's timely little book.

# CORRESPONDENCE.

*[We are not responsible for opinions expressed by Correspondents.]*

## Dyes and High Explosives.

SIR,—A very remarkable speech on the above was made at the annual meeting of the Bradford Dyers' Association, Limited, by Mr. Milton S. Sharp, the Chairman of the Board of Directors. I have no doubt that this has not escaped your notice, and that you will not fail to extract from it the lessons needed by us all. I take great interest in this particular question. War found Great Britain unprepared. Is Peace going to find us still more unprepared?

Some of the facts which Mr. Sharp, with his great knowledge of the dye industry, brings before the public—or rather I should say before a small portion of the public—need grave consideration. He states that the dye industry is a "key" industry—a key to export business aggregating £200,000,000 a year, and to the employment of 2,000,000 people. I select a sentence from his speech which I recommend all to read. They will find it buried in "The Times" of Tuesday, Feb. 29, in the financial columns, although it is true that "The Times" directed special attention to the speech. Well, the sentence to which I wish to direct attention is this:

> "The complete, self-contained, and independent manufacture of aniline dyes within the United Kingdom is essential to the commercial and martial protection of the State."

He next pays a very high tribute to the work that has been done under the High Explosives Department. I will venture here again to quote. Speaking of Lord Moulton's Committee he says:

> "The country will probably never know how much it owes to the High Explosives Department of the Ministry of Munitions, presided over by Lord Moulton, and officered by a body of strikingly able and energetic men, to whose commanding force it is due that the danger from a shortage of high explosives has been so effectively met."

This is great praise and well merited, and must be very gratifying indeed to gas engineers, considering how much their patriotism and professional skill have contributed, and are contributing, to the great results obtained.

In Germany, as is well known, a dye-works was a high-explosive works and *vice versâ*. Mr. Sharp tells us that the works which, with the same raw materials and 10,000 men, were making aniline dyes before the war, have ever since been making, with 14,000 men, high explosives. When Peace comes, will they not immediately turn over these 14,000 men in that particular works again to the manufacture of aniline dyes?

No doubt a very forward step in the direction of restoring the synthetic dye business to England has been taken by the Gas Light and Coke Company, a full account of which may be read in the admirable speech of the Governor, Sir Corbet Woodall, at the last half-yearly meeting of the Company. But action is necessary in regard to the whole of the production of benzol, toluol, and the acids throughout the country. Mr. Sharp indicates that a great deal has been done for the production of all these materials, and that the Government has especially expended large sums of money on acid production. He asks very pertinently; Are all these works now to be scrapped? I venture to ask, in like manner, if the excellent results which we have discovered can be obtained by the use of the Carpenter process and other means, are to be no further developed when the war is over, when it would be so easy to divert the whole of these products into a new channel and place in the hands of England a power in peace or war of incalculable advantage? This power now is ready at the door of the British people. It is only necessary to realize what it means first, and then set about organizing the methods for grasping and guarding that power in our own hands.

I will not venture to presume here to lay down any scheme as to how this should be done; but I would venture to make one small suggestion—that in the first place the Council of the Institution of Gas Engineers should take the matter fully into their consideration, as to how best the Institution and other of our own Associations, dye users, dye producers, and tar distillers could be brought into co-operation with the least possible delay, in order that Parliament should be induced to take action before the terrible words "too late" are written over the doors of a lost opportunity of such magnitude.

THOS. CANNING, Engineer,
Newport Gas Company.

*Newport (Mon.), March 1, 1916.*

## Gas Companies as Owners of Collier Vessels.

SIR,—As some observations of mine at the general meeting of the Commercial Gas Company do not appear in your report, and as they are, I consider, of considerable interest to your technical readers just now, when the ownership of collier vessels is spreading among the larger companies, I shall be glad if you will let me say that the employment for their sole use and at terms of interest on capital by the Commercial Company (practically owning these vessels) was inaugurated as long ago as 1886 for ships capable of discharge at the only river staith that the Company had at Wapping. These ran very profitably; the freights, charges, and agency to the manager (a Mr. Suart) being for the year 1887 under 2s. 9d. alongside. The contractors for the provision of ships were Messrs. F. Green and Co.—the firm of now Sir Frederick Green.

But the development of gas making at the Poplar works, on the River Lee, made it expedient to consider the employment of smaller vessels—such as could penetrate the creek windings and the bridges. These were not to be contracted for, as they would be useless for general traffic; and the Company faced the proposition of building at their own capital cost. So in 1900, two years before my retirement, one of the former vessels, the s.s. "Poplar," 1350 tons, was bought, and two smaller ones, about 650 tons each, successively designed and employed—the s.s. "Commercial" and the s.s. "Bromley." Later the s.s. "Poplar" was sold, and the s.s. "Mile End" put into her place. The drawback of the smaller steamers is the extra cost of wages, provisions, engine stores, &c., due to the smaller carrying capacity in later years, accentuated by the rise in cost generally under all these headings, and in war time largely again increased as the Chairman explained.

For now a good many years the Wandsworth Gas Company have had successively one, two, and three steamers running at great advantage, because (like the Commercial's Poplar vessels) there is at least saved 1s. on loading and 6d. to 9d. barging for those who cannot use the steam-vessel direct. But war freights are driving the larger companies to the same practice; and it will be an illustration of the old proverb that "out of evil cometh good," for from thirty years' experience I know that by the sliding-scale it will spell cheaper gas to the community for all time ahead.

The difficulty of building and working the boats was less to the writer than that of convincing Directors—who were some timid, some shortsighted—of the value of the scheme.

Fortunately, the present Chairman took great interest in the scheme, and went with the writer to the trial trips of the first two steamers built for the Company.

HY. E. JONES.

*Palace Chambers, Westminster, March 4, 1916.*

## Broadstairs Gas Company.

SIR,—After the receipt of the 1914 report of the above-named Company I felt constrained to write the letter you published in the "JOURNAL" for May 4 last year, p. 283.

Judging by the report now to hand for 1915, I am only sorry I kept my deeper thoughts to myself at the time; for the latest statement of the Company's working makes very unwelcome reading. In short, close and immediate investigation of its affairs appears to be vitally necessary.

Although on a much smaller scale, one cannot help comparing the present position with that of the Alliance and Dublin Gas Company in the unfortunate phases of its career when criticism first came from my pen. Before its reorganization, the Dublin Company did not pay its full statutory dividend; and Broadstairs is in like state. To me that is sufficient comparison to warrant reorganization in this case; for when a sliding-scale company fails to manage its business in such a way that dividends in measure with the price of gas charges to the public are impossible, then there is something radically wrong, and the Company's "house" wants "putting in order." Now from the letter above referred to it will be seen that so recently as January, 1915, the ordinary "D" stock of the Broadstairs Company was offered as bearing 7 per cent. dividend "free from tax." On the then selling-price of gas—viz., 3s. 3d.—a distribution at the rate of 9 11-40ths per cent. was permissible. Incidentally one should mention it was submitted that the 7 per cent. free of tax was equivalent to a dividend of £8 per cent. less tax (then standing at 2s. 6d. in the pound).

My surprise, therefore, when a few days ago I received the report and accounts for 1915, is difficult to express. The reason is not far to seek. Thus the dividend proposed on the 7 per cent. stocks ("B," "C," and "D") is 1 per cent., less tax; in other words not $\frac{7}{8}$ per cent. What will the feelings of the investor of January, 1915, be with the lurement of 8 per cent., less tax, and the result—a drop of over $7\frac{1}{8}$ per cent. for the year? The above announcement is also accompanied by this strange anomaly—namely, that it is proposed to pay 4 per cent. on the 10 per cent. "A" stock, whereas on a *pro ratâ* basis the dividend should be £1 3/7ths per cent. Why this curious nursing of the "A" stockholders, who get 40 per cent. of their previous year's dividend, while the others are to be put off with some 14 1/3rd per cent.? An explanation is surely necessary; and it is for the shareholders at the forthcoming meeting to see that one is given.

However, the point to which I wish to draw particular attention is the general conduct of the undertaking. The principle truly controlling sliding-scale companies is apparently ignored; and the manner of fixing dividends and the price of gas fortuitous and unsystematic. In this connection, I need only instance the fact that up to July last year the price of gas was 3s. 3d.; to-day it is 4s., and yet we know the unfortunate result.

The standard price per 1000 cubic feet in the case of this Company is 4s. 4d., at which selling price the dividends of 10 per cent. and 7 per cent., according to class of stock, should be paid. If circumstances at Broadstairs are so exceptional that gas cannot be sold at a low figure, then, to point the moral of my letter of last year, the price should be fixed to yield a revenue sufficient to cover working expenses and yield the statutory dividends. Without going into details, I estimate that, with gas at 4s. 6d. per 1000 cubic feet, the Company can meet the expenditure and (on the sliding-scale basis applying) pay £9 10s. per cent. on the "A" stock and £6 13s. per cent on the remaining classes.

At any rate, something must be done to stop the downward tendency of the Company's affairs. Unfortunately, travelling is difficult in these strenuous times; but I would ask for a rally of shareholders at the approaching meeting, so that measures may be developed to stop the "dry rot" that has evidently set in.

R. W. EDWARDS ["NONULUS."].

*Brooklands, Aldershot, March 3, 1916.*

## Mortgage Bonds.

SIR,—Owing to the present extraordinary prevailing conditions with regard to rates of interest for money or mortgages caused through the war, it is my personal experience (being an officer of a statutory gas company) that many bondholders are now naturally desiring higher rates of interest upon their loans than heretofore. Consequently, my company have since the commencement of the war been renewing same at a higher rate of interest upon a six-months' notice of repayment on either side, without specifying any term of years. Therefore, as the "national" rates of interest are being increased for various purposes from time to time, bondholders observing same give us the necessary notice for repayment of their money or an increase in the rate of interest. To retain same, the concession has to be made. Our procedure, consequently, has been to prepare a new bond in each case, stamped at the rate of a substituted security; but seeing how often this

is being repeated, I would like to know, if possible, if the issuing of such new bonds could not be legally overcome by an endorsement upon the back of the existing bonds every time an alteration is made in the rate of interest.

I would be obliged if any of your readers would give me, through your columns, their experience under similar conditions.

*March* 1, 1916. ENQUIRER.

## Showroom Reform.

SIR,—I venture to ask your further indulgence in reply to the letter of Mr. Cyril Davis in your last issue.

I am sure the thanks of all showroom attendants are due to him and also to your courtesy in allowing us all the use of the columns of the "JOURNAL" to state our case.

There is, in my opinion, so much which is good in Mr. Davis's letter, that one hardly likes to criticize the remainder. But I cannot help thinking that he is skating over rather thin ice when he suggests "that showroom experience should be regarded rather as a means to an end, than an end in itself." I would far rather take the standard he himself sets up in his admirable article on the 8th ult. I would ask: Are there appointments waiting outside the showroom for all those who excel in that department? If so, What are they? No; let us deal with realities. One cannot find a solution by simply saying "that the position of the showroom attendant is probably no worse than that of men engaged in any other sphere of activity," because that is a purely hypothetical statement which might be analyzed. There, together with the absence of a status, lies the crux of the whole case so far as we are personally concerned.

All we ask for is a "Place in the Sun;" a recognition of initiative; a desire shown openly of "co-partnership" in reality; an appreciation of work well done under, sometimes, very trying conditions; and, finally, that word of praise which is worth its weight in gold.

*March* 1, 1916. A SHOWROOM ATTENDANT.

SIR,—May I be permitted to add my appreciation to the excellent articles by Mr. Cyril G. Davis on the above subject. I hope he will see his way to have them reprinted, and that all gas undertakings will present a copy of each to every member of their selling staff.

The letters of "Fair Play" and "Another Showroom Attendant" are quite outside the spirit of Mr. Davis's remarks. If we attain to the all-round efficiency which these articles advocate and so ably describe, we shall be able to command a position of dignity and authority, with its accompanying increase of salary.

Such a one could not be crushed; for he would win the approval of all he came in contact with. And, after all, it is what the consumer and (through our efficient treatment of his or her wants) what our chief thinks of us, that counts; not what we think of ourselves.

I am convinced that the real road to showroom reform lies primarily in bringing those of us who are privileged to work in the showroom up to the standard of efficiency set out so admirably in these articles. The salesman who has thus equipped himself would always make his showroom a real selling power, whether its architecture were ornate or not in its character.

Perhaps an additional outcome of the increased study of the subject will result in the formation of an "Association for Showroom Salesmen," which would enable members to benefit by an interchange of ideas, and by means of which correspondence courses in the science of salesmanship be made possible for those who are both keen and shrewd enough to undertake them.

*Feb.* 28, 1916. NORTHERN SHOWROOM MANAGER.

## An Increased Output at Exeter.

The report presented at the annual meeting of the Exeter Gas Company—Mr. G. Hardy Harris presiding—showed an increase in the sale of gas of more than 18,000,000 cubic feet, or just over 4½ per cent., for the year. The payment of 10 per cent. per annum on the £40,000 original stock, and 7 per cent. on the £46,500 new ordinary shares, was recommended. The Directors much regretted that Mr. W. R. Moore had resigned his seat on the Board, and stated that they had elected Mr. Joseph C. Wippell to fill the vacancy. The revenue account showed a profit of £11,094; the expenditure being £71,455, and the receipts £82,539. The Chairman, in moving the adoption of the report and accounts, said, considering the circumstances of the time and the general dislocation of trade and of established customs, the Company had reason for congratulation on so satisfactory a report. Coal had not only risen to an enormous price, but was very difficult to get, and labour was scarce. Of their employees, 32 per cent. had gone away in the service of their country. He did not suggest that it would be possible to maintain the large increase which they made last year. Not only must they expect private consumers to use less gas for lighting and heating, but the reduction of street lighting had been effected by practically the exclusion of gas-lamps; the Corporation naturally preferring to retain the electric lamps which they supplied. The income from residuals was largely increased because the price of coke was high, and they had at the beginning of the year an unusually large stock, which was now practically exhausted. He expressed the hope that the cost of both coal and freights would decrease. In response to the request of the Government, they had put down the necessary plant for the extraction of all the possible toluene from the tar. In this connection, he desired to make it known that the price paid by the Government for the product did not recoup the Company for the outlay on plant and labour. After paying a dividend at the same rate as last year, a balance of £874 was transferred to reserve. The report was unanimously adopted, and dividends for the half year ended Dec. 31 were declared as follows: Four per cent. on the preference stock, 5⅛ per cent. on the preference shares, 7 per cent. on the new ordinary shares, and 10 per cent. on the original stock. The Chairman acknowledged the valued co-operation of the Secretary (Mr. W. N. Westlake) during a year, when circumstances had thrown considerable additional responsibility upon him, and also paid a warm tribute to the loyal help rendered by the Works Manager (Mr. Wood) and other members of the staff.

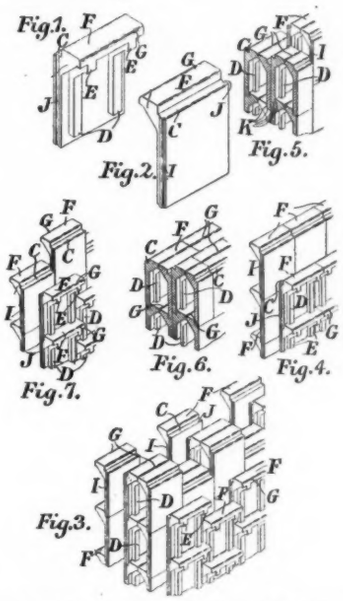
# REGISTER OF PATENTS.

## Regenerator Chambers in Carbonizing Plants.

GROVE, H. E., of St. Kilda, and BARKER, F. G., of Camberwell, Victoria.

No. 1738; Feb. 3, 1915.

This invention has been devised "to provide means by which a more satisfactory construction of a certain portion of a gas making or carbonizing plant may be carried into effect." The patentees have designed a specially-shaped and fortified tile from which the lining or wall separating the exit for the spent gases from the incoming air is constructed—"the tiles in their arrangement forming double-keyed vertical joints and at the same time permitting a thin wall of a good heat-conducting material to be employed."




**Grove and Barker's Regenerator Flues for Retort-Settings.**

Figs. 1 and 2 are a front view in perspective and a rear view of the front of the tile referred to. Figs. 3 to 7 illustrate the method of setting employed.

The tile is about 17 inches in height by 1⅜ inches thick across its vertical section, and widening out towards the top to a width of about 6 inches, and having a face approximately 12 inches wide. Along the upper portion, a part C (preferably about 2 inches deep) is channelled out to enable the bottom of the next tile above to fit and form a key. Two vertically placed webs or ribs D are formed in the inner (or front) face of the tile—*i.e.*, proceeding from the portion of 6-inch width at the top to within about 2½ inches from its bottom; so that the end of each rib terminates slightly above the top face of the next lower tile. The upper portion of the rib bends inwardly at E to a central vertical line, so as to meet a rib of an opposite tile of similar construction. The top flat faces F of the two meeting tiles form the floor of each particular flue through which the inlet air passes in a baffled travel to the producer vents. The inner top edge of each tile is slightly splayed off. On the two splays meeting, a downwardly pointing V-shaped channel G is formed, which is filled with fire clay or other stopping to close the meeting edges of the two oppositely arranged tiles. A continuity of these tiles (as shown in figs. 3 to 7) is employed to the required height for supplying air to support combustion at the producer exits; and a similar parallel vertical arrangement is employed through which the outgoing heated gases escape downwardly in a sinuous or baffled travel.

The parallel sets of inlet and outlet passages are placed against one another (in their vertical setting), and the joints of one set are stepped at such a height from the adjacent set that the channelled keyways in the one set are a few inches higher than those in the adjacent set—"thus avoiding the escape of incoming air into the spent escaping heat fume ducts leading to the chimney flue." There are thus five separate faces K containing fire-clay between the incoming air and the outgoing gases in the keyed tile settings. The channels C, and the lower portions of the tile fitting therein (producing these five faces), completely obviate any commingling of the incoming air with the escaping gases, but, nevertheless, allow a comparatively thin wall (say, 2¾ inches) of material for the heat to pass through, or radiate into, the inlet air.

One end of the front face of the tile (approximately 12 inches in width) is rebated at I to correspond with a concave or groove J on the opposite edge of the next tile, so as to form a bond.

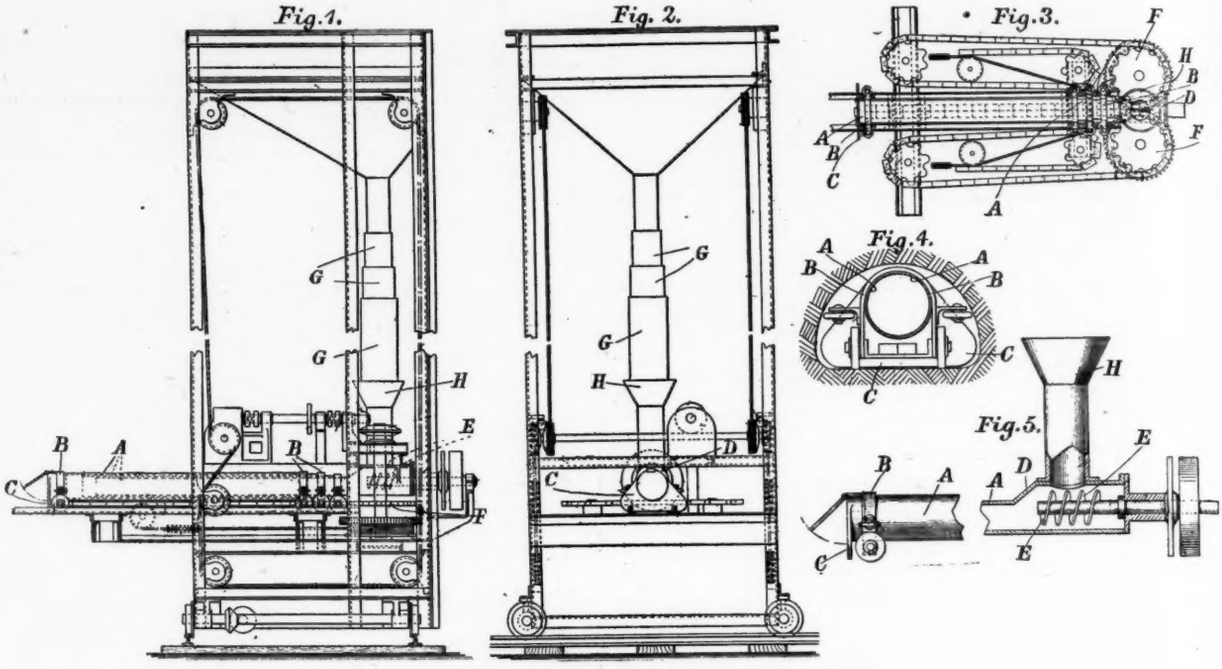
From the top of the vertical arrangement for the incoming air a curved conducting flue is led up each side of the arched top of a producer furnace, "so that the heated air joins with the exuding producer gas and proceeds along a horizontally placed flue running in parallel arrangement with the retorts." The mixed gases form "a flame that proceeds upwardly along one side and under half the bottoms of the retorts, and, after passing over the latter, finds its way downwardly into a vertical duct leading to the main chimney flue."

## Charging and Discharging Gas-Retorts.

FIDDES, W. J., of Tottenham.

No. 2340; Feb. 13, 1915.

This invention relates to apparatus for "charging and discharging gas-retorts, coke-ovens, and the like, or for conveying coal or other materials."




Fiddes's Gas-Retort Charging and Discharging Apparatus.

Fig. 1 is a side elevation of the apparatus. Fig. 2 is an elevation of the end next the retort. Fig. 3 is a plan of the mechanism for operating the telescopic tubes and bar forming part of the invention. Fig. 4 is a section looking into the mouth of a retort. Fig. 5 is a side elevation of the feed hopper.

A series of telescopic tubes A (preferably circular) are provided with a carriage B carrying rollers to support the tubes, attached to brackets on the sides of the carriage. The end of the outside section of tube is fitted with a flap lid, hinged so that it hangs vertically and can only swing outwards. This outside section of tube may, in addition, carry the usual front push plate C for driving the coke out of a through retort. The tubes are carried on a track while collapsed and on the machine. Attached to the innermost tubes is a casing D, in which is a filling or thrusting device consisting of either a reciprocating plunger, an endless band or chain, conveyor, or (as shown) a revolvable screw E, the spindle of which is attached to a flywheel which gives impetus to the screw.

Near the back of the apparatus are two drums F (carrying chains), preferably placed close together, so that they may be conveniently connected to the carrier of the front end section of the telescopic tube. Each chain is constructed so that it can only be wrapped in one direction, and is so positioned with regard to the other drum that, when placed side by side, the two form "a rigid bar incapable of being bent from any cause." By applying power to the drums this chain rod is actuated and the tubes are pushed out to their full length, and drawn back at what speed may be desired.

To enable the chains to be moved backwards and forward to push out or draw in the tubes and "to economize space as much as possible," the chains, after being passed round the drums F, are conveyed to similar drums journalled to a bracket on the front end of the machine (see fig. 3) and then back to similar, but smaller, drums near the drums F, around which they are passed, and then alongside the chains between the drums to vertical pulleys fitted to the frame of the machine, where their ends are connected to wire ropes passed over pulleys. Between the drums are toothed wheels meshing together and forming one concrete article—both sets always moving together and in the same ratio.

The coal is supplied to a valved hopper at the top and passed down telescopic shoots G to a hopper H—the shoots collapsing or extending according to the up and down movement of the tubes and their frame to suit the height of the retort. The tubes, chains, drums, gear wheels, power engines, track, gear, and other appliances (except the hopper and telescopic shoots) are carried by a framework capable of being raised or lowered to suit the height of the retort to be operated, and at the same time (through suitable gearing) be moved along a track on the retort-house floor.

The action is as follows: Power is applied to the drums F to drive the chains, together with the tubes A, to which they are attached, into and through the retort to the furthermost end; and coal is delivered from the main hopper into the charging apparatus D. The coal comes in contact with the screw E, or other filling or thrusting device, and is thereby driven forward into the tubes, as they are being extended to their full length in the retort. As soon as the tubes have reached the furthermost end of the retort, the action of the drums F is reversed, and the chains and tubes are withdrawn, during which operation the tubes are telescoped together, the flap lid in front opens, and a continuous delivery of coal into the retort is effected—the screw acting as a resistance to the coal.

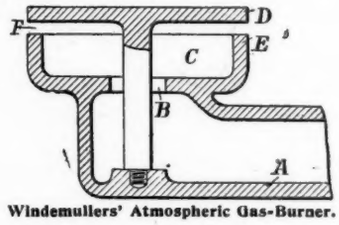
By regulating the speed of withdrawal of the tubes and of the coal feed, the retort can be either lightly charged or absolutely filled with coal as may be desired. And, if desired, the apparatus can push the coke out of the retort by means of the usual push-plate C, in combination with the shut flap lid, which will prevent coke being forced into the tube mouth.

## Atmospheric Gas-Burners.

WINDEMULLER, J. H., of The Hague.

No. 2498; Feb. 16, 1915.

This invention refers more specifically to burners of the kind in which additional flame-spreaders are used in conjunction with the mixture-tube. The patentee's previous inventions are No. 2193 of 1903 and No. 6277 of 1911.




Windemullers' Atmospheric Gas-Burner.

A vertical section is shown of a burner (with one inlet orifice and one burning opening) preferably used for household purposes. A is the tube through which the mixture of gas and air is supplied to the inlet orifice B of the expansion chamber C, which is enclosed by a cover D and the bottom plate E. The inlet is very small in comparison with the wide slot F, of great length, between the parts D and E. Yet the flame is said to burn "quietly on such slot without showing a tendency to strike-back."

In a domestic burner resembling that shown, the inlet B may, the patentee says, have a diameter of 17 mm. and the stem of the disc D a diameter of 8 mm., so than an annular opening of approximately 177 sq. mm. is available for the passage of the mixture from the mixing tube A to the expansion chamber C. The diameter of the flange E of the mixing chamber may be 36 mm., and the width of the burner opening F may be 4 mm., so that the opening on which the flame burns has an area of approximately 452 sq. mm.—approximately two-and-a-half times the area of the opening B. In such a burner, it is claimed, the flame does not burn within the chamber C, although the burner openings are relatively of such large size that they would not serve to prevent back-flashing of the combustible mixture in a bunsen burner at the pressures at which coal gas is ordinarily supplied for lighting and other domestic purposes.

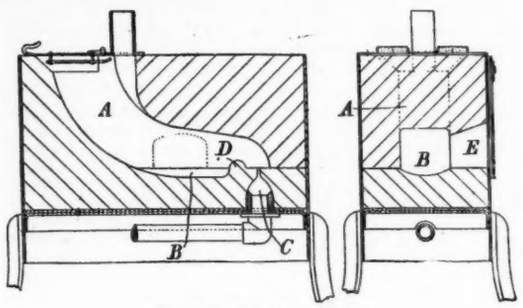
## Gas-Furnaces for Heating Rivets.

BROWN, D. A., of Glasgow.

No. 16,906; Dec. 1, 1915.

This invention has for its primary object to provide a hot chamber at the base of a shoot down which a series of articles (say, rivets) may

"gravitate in the form of a procession." The characteristic feature of the invention is the provision of a hot pocket at the base of the shoot and opposite a surface impinged on by the flame from a gas-nozzle located within the furnace—the hot pocket being so arranged that its contents are maintained clear of the gas-flame.




**Brown's Gas Rivet-Heater.**

As shown, the furnace comprises a jacket of highly refractory material (fire-clay), shaped internally so as to present an inclined shoot A, the upper end of which is normally closed by a door for putting in the rivets to be heated, and the lower end formed at B as a pocket for the reception of the rivets. Within the furnace and to one side of the pocket is the gas-burner nozzle C, so arranged that the flame impinges on the adjacent upper wall of the shoot and renders it incandescent. Intermediate the nozzle and the pocket is a rib D, which, while performing the usual function of a furnace bridge, also serves as a guard to prevent the entrance of the rivets at the forward end of the procession into the space reserved for the nozzle. The outlet for this is through the doorway E.

## APPLICATIONS FOR PATENTS.

**[Extracted from the "Official Journal" for March 1.]**

Nos. 2533—2917.

Atkinson, H. G.—"Taps or cocks." No. 2649.
Bennett, W.—"Purification of coal gas." No. 2860.
Carroll, L. D.—"Coal-gas making apparatus." No. 2783.
*Chrisman, C. S.*—See Carroll. No. 2783.
Dick, P.—"Taps or cocks." No. 2764.
Fleischer, J.—"Gas heating-stove with superheater." No. 2749.
Haegele and Zweigle.—See Fleischer. No. 2749.
Jackson, A.—"Controlling combustion in coking plants." No. 2909.
*Koppers Company, H.*—See Jackson. No. 2909.
Macleod, J.—See Bennett. No. 2860.
Sandow, E.—"Appliances for use with gas cooking and heating plates." No. 2799.
Taylor, J. R.—See Atkinson. No. 2649.

Applications for Restoration of Lapsed Patents.

Notice is given that the Ellwhite Gas-Stove Company, Limited, have made application for the restoration of the patent granted to William White for "Improvements in gas-stoves," No. 23,033 of 1910, dated Oct. 5.

Notice is given that William Reavell and Reavell and Co., Limited, have made application for the restoration of the patent granted to them for "Improvement in mechanism for converting rotary into reciprocating motion, applicable to pumps, compressors, and other machinery," No. 17,026 of 1907, dated July 25.

### Treatment of Consumers' Meters.

The American Gas Institute have appointed a Committee to obtain information and statistics on the lines of the following list of questions that has been circulated among the members:

1. How long should a meter be allowed to remain on a consumer's premises in a locked-off or not-used condition?
2. How often should a meter be brought in for test?
3. How long should meters be allowed to remain in service which pass very large amounts of gas or which supply a fluctuating load, as, for instance, gas-engines?
4. What is the best maximum size and capacity of meter which should be used?
5. Where meters are set in batteries, what is the best arrangement?
6. What is the best practice in removing meters with regard to the rigid connections and shelves? For instance, is it better to shut the gas off at the meter?
7. Instructions as to handling meters by fitters and also on waggons.
8. What is the best practice of shutting-off the gas when service is discontinued? For instance, is it better to shut the gas off at the kerb or at the lock-cock, or is it best to insert a blind-washer in the union?
9. What are some of the weak points of some of the best meter rigid couplings and meter shelves?
10. Notes containing a "Caution" to those setting meters to make sure that the outlet riser is firmly fastened to a permanent part of the building.
11. A table of "Don'ts" showing where and under what conditions a meter should be set.
12. Under what conditions should a meter which has been brought to the shop for test be allowed to be reset—provided, of course, that it tests satisfactorily?

# PARLIAMENTARY INTELLIGENCE.

## HOUSE OF COMMONS.

A Bill to confirm a Provisional Order under the Private Legislation Procedure (Scotland) Act, 1899, relating to Aberdeen Corporation Water, was presented by Mr. M'Kinnon Wood last Tuesday, read the first time, and ordered to be read a second time to-morrow (Wednesday).

The District of the River Dee District Board have presented a petition against the above Bill.

# LEGAL INTELLIGENCE.

### Liability for a Hotel Gas Bill.

The question raised in the Sheriff Court at Airdrie, of whether a party whose name appears on the valuation roll as owner and occupier of a hotel is to be held liable for the gas consumed on the premises, has been sent by the Sheriff-Substitute to probation. The case is that in which the Provost, Magistrates, and Town Councillors of the Burgh of Bridge of Allan sue John Benson, accountant, of Airdrie, for £34 for gas consumed in a hotel in Bridge of Allan. The defender pleaded that he was merely the nominal holder of the property for a bondholder, and that although his name was, by arrangement, put on the valuation roll as the occupier, it was simply to meet the requirements of the Assessors, who required some one to be entered as owner and occupier. He further pleaded that the hotel, during the period covered by the account, was occupied by a former manageress for her own behalf, and that he never occupied the premises nor consumed the gas. After hearing the law agents of the parties, Sheriff Lee has repelled their pleas in law so far as preliminary, and allowed parties a proof of their averment. His Lordship said that if the only ground of alleged liability for the charges made upon the defender was the entry in the valuation roll of defender's name as occupier, he was of opinion that the action would not be relevant. He was not prepared, as at present advised, to lay much stress upon the provisions of section 45 of the Burghs Gas Supply (Scotland) Act, 1876, which defender's agent seemed to think required the Gas Commissioners to have a written contract or request for the supply of gas as the foundation of any claim for charges. This section seemed to have been framed to meet the case of persons, not hitherto supplied, requesting a supply by an extension of the section to include their premises; and his Lordship doubted whether it was applicable at all to the circumstances of this case, but thought it clear that, unless the pursuers could allege a contract with the defender, or that the gas was supplied on his credit, their only claim against him for these charges must be as a consumer of the gas charged for. It was because the pursuers averred that the defender was, during the period of the account, in fact the occupier of the premises and the consumer of the gas that his Lordship thought their case was relevant. As the parties were at issue on a relevant question of fact, a proof must be allowed, and pursuers were appointed to enrol the case for the purpose of fixing a diet.

### Chelmsford Gas-Works Purchase.

The report submitted at the annual meeting of the Chelmsford Gas Company congratulated the stockholders upon another very successful year. The price of gas was reduced by 2d. per 1000 cubic feet from Jan. 1, 1915; and notwithstanding this reduction and the increase in the price of coal and wages, the gross profit was £2083 more than in the previous twelve months. This was mainly due to the large increase in the quantity of gas sold—namely, 15 9 per cent.—and to the better price they obtained for residuals. As the Company were now working under a sliding-scale, the Directors were able to recommend a dividend for the year at the rate of 5¼ per cent., instead of the standard rate of 5 per cent. An interim dividend at the rate of 2½ per cent. had been paid, leaving a balance of 2¾ per cent. for the final dividend. The Town Council had given notice of their intention to purchase the gas undertaking; and proper steps would be taken to ascertain the price to be paid for it. As the Corporation were not able to borrow the purchase-money until twelve months after the termination of the war, they would take over the works when terms had been arranged, and pay interest, half-yearly, at the rate of 5 per cent. per annum on the purchase money, which sum would be distributed by the Directors, who would remain in office to look after the interests of the stockholders. New retorts had been installed to deal with the extra demand for gas; and an additional gasholder was in course of construction.

**Satisfactory Progress at Newport (I.W.).**—The report presented by Mr. R. Pinnock, J.P., who presided at the annual meeting of the Newport (I.W.) Gas Company, on the 25th ult., stated that the gas sales showed an increase of 3¼ per cent. on those of the previous year, which, having regard to the adverse conditions of lighting prevailing consequent on the war, might be considered satisfactory. The works had been insured against aircraft damage and bombardment. The payment of part wages to dependants of employees on war service had been continued. Owing to the enormous increase in the price of coal, the Directors were compelled to raise the price of gas 4d. per 1000 cubic feet from April 1. The continued high cost of coals and freights was still a source of anxiety; and as it seemed unlikely that any relief could be expected during the war, it might become necessary still further to raise the price of gas. The Directors recommended the payment of a balance dividend of 2 per cent. on the preference stock and 3 per cent. on the ordinary stock—making, with the half-yearly interim dividend, 4 and 5½ per cent. on the respective stocks, which are the maximum dividends payable at the existing price of gas. The report was adopted.

# MISCELLANEOUS NEWS.

## DYES AND HIGH EXPLOSIVES.

Addressing the shareholders of the Bradford Dyers' Association on Monday last week, the Chairman (Mr. Milton Sharp) referred to what he described as the startling fact which the war had revealed to the thoughtful mind and impartial eye of every intelligent man who had been brought into direct contact with the difficulties arising from the shortage of aniline dyes—namely, that the establishment of the synthetic dye industry in this country was vital to national safety. To the uninitiated it might seem very strange, but it was a simple fact, that dyes and high explosives were very closely co-related. Benzol, toluol, arbolic acid, sulphuric, and nitric acids were the raw materials from which dyes and high explosives alike were made; and it would indeed be a tragedy if the English failed to learn the lesson the war had taught them—that ability to produce unlimited quantities of these articles was one of the first essentials of any hope of success in warfare. The complete, self-contained, and independent manufacture of aniline dyes within the United Kingdom was essential to the commercial and martial protection of the State. The raw materials from which aniline dyes were made being the same as those used in the manufacture of high explosives, let them picture to themselves the enormous advantage Germany had by reason of her huge, highly-organized, and ably-administered colour-works, producing all the raw materials required for the making of high explosives, and able immediately to divert much of the colour-making plant to their manufacture. What was this country's position? They had to improvise an Army. They had also to improvise the production of high explosives.

### After the War.

The country would probably never know how much it owed to the High Explosives Department of the Ministry of Munitions, presided over by Lord Moulton, and officered by a body of strikingly able and energetic men, to whose commanding force it was due that the danger from a shortage of high explosives had been so effectively met. Referring to the extension of munition works, the speaker said most of such extensions had been made to serve a temporary purpose only, and at the end of the war would be demolished, unless such portions were retained as could be utilized in producing the bases for aniline dyes. Some were of a permanent character, especially those in connection with acid plants, on which the Government directly and indirectly had spent tremendous sums. These also would be useless and valueless after the war unless the colour industry was established in this country, to which end such plants were a long and essential step; and it would be little short of criminal folly to break them up. He desired to urge with all the force with which he was capable that this country must never again jeopardize its national safety by the risk of shortage of high explosives, and that, whatever it involved, they must establish the aniline dye industry in this country, so that in case of war the country would have the ability to quickly produce any amount of high explosives the Army or Navy might need. Until this was done the nation would always be at a great disadvantage as compared with Germany. He was confident, if public opinion could once understand the situation, it would be practically unanimous in demanding the most thorough-going and drastic action, quite regardless of cost.

### Occupation in Peace and War.

On his last journey to Germany, just before the outbreak of war, he visited all the large colour-works; and it would bring home to them what terrible instruments such works were for enabling the German Government to carry out its policy of "frightfulness" when he told them that one company alone, then employing about 10,000 men, chiefly in the manufacture of aniline dyes, to-day (he was credibly informed) were employing 14,000 men almost entirely on the manufacture of high explosives. Only those with some knowledge could realize the facility with which a colour-works could be converted into a high-explosives factory. Another works visited at that time employed about 9000 men in the manufacture of aniline colours and pharmaceuticals. He had information, to which he attached entire credence, that to-day these works were engaged almost solely in making T.N.T. and picric acid for the German Government. During the course of the same journey he gathered that 75 per cent. of the collieries in Germany had coke-ovens installed. When it was realized how vitally important the distillation of coal in coke-ovens was in relation to the manufacture of aniline dyes and high explosives, it would be seen how this alone gave Germany an enormous advantage over us in the early stages of the war, as the bye-products from the coke-ovens were among the most important materials for making colours and explosives—whereas in Great Britain at the outbreak of war only some 25 per cent. of the collieries had coke-ovens installed.

### Ammonia and Nitric Acid.

He was also told that three of the principal German colour-making concerns, who pooled their profits, had shortly before increased their capital by £2,250,000, for the purpose of erecting works for the production of ammonia from the air. At that time they estimated they would produce 130,000 tons of ammonia per year; it had since been stated that this production had been increased to 200,000 tons, and was now being converted into nitric acid. The raising of so much capital for such a purpose was noteworthy even on the surface; but it was even more striking in the light of the now certain knowledge as to the preparations of Germany for war. It was impossible to avoid the conviction that the use of such a plant in the event of war was duly taken into consideration. It had been said that the supply of high explosives to the German Army would by this time have ceased had it not been for this plant. It was quite possible that the stocks of nitrate of soda would now have been exhausted; and without nitric acid, no high explosives could be made. It was many months after the outbreak of war before it was seen by us that high explosive shells would be the dominating factor. Germany, realizing the failure of her fond hopes of a speedy triumph, knew quite well what the character of the warfare would be; and her possession of huge colour and chemical works enabled her to set about immediately producing almost unlimited quantities of high explosives. This country was in no such position—we had no works in the slightest degree comparable with the great works in Germany. Experience proved how essential it was to the national safety that such works should be established here, and illustrated the folly of which we had hitherto been guilty in materially aiding the development and prosperity of those works in the country of a potential enemy.

### Dye Users and Dye Producers.

How could this establishment be accomplished? No one with any knowledge would venture the opinion that it could be attained through British Dyes Limited alone. He wished to speak with great respect and the deepest gratitude for what that Company had done. Faced with a tremendous task, made incomparably more difficult by the prior claim of explosives upon the raw material, it had done really splendidly. The want of raw materials had hampered the efforts also of all the British, Swiss, and French makers. And when such difficulties disappeared, he was sure British Dyes Limited would not claim that they alone would have the power to free us from German domination in this the greatest "key" industry—a key, not only to export business aggregating £200,000,000 a year, and to the employment of some 2,000,000 people, but, what was of far greater moment, also to the national safety. Indeed, there were few things which this terrible war had made more clear than that, both from the economic and national defence standpoints, there was no question of greater urgency than the rapid establishment of the aniline dye industry in this country. It certainly called for further and immediate action by the Government and Parliament; but before he indicated the form such action, in the opinion of the Directors, should take, he would like to point out ways in which assistance of great value could be given to British, Swiss, and French colour makers.

### A Commission for the Establishment of the Industry.

In the first place, he would urge greater sympathy and closer co-operation between dye users and dye producers. By a very simple process the allied Governments could do much to aid British, Swiss, French, and Russian colour makers by entirely prohibiting the use of any German dye on goods used in any Government Department. The policy which the Directors favoured was practically that which they urged upon His Majesty's Government before the formation of British Dyes Limited, and which, stated in the briefest terms, was that the Government should make a grant-in-aid of (say) £500,000 per annum for a period, to be administered by a Commission charged with the duty of securing the establishment of the industry in this country, by grants on production, and for enterprise and initiative. The number of the Commission should be limited, and its members carefully chosen so as to unquestionably command the confidence of the British, Swiss, and French colour makers, and of the users, who could give invaluable aid. If this were so, it would make possible what, without it, would, he feared, be quite beyond reach—namely, a definite unity of purpose by the proper co-ordination of production and the mutual supply and exchange of raw and intermediate products.

Such a Commission, provided, as it would be, with special means for the fulfilment of its mission, and by enterprising, energetic, and fearless leadership, watching with the utmost vigilance the progress of the various colour-making works, would, in the opinion of the Directors, secure the establishment of the industry in this country, not only on less debatable lines, but also much more quickly than by import duties; and, even in the event of the imposition of such, the saving of time would be well worth the cost for two or three years.

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Under the heading "Solving the Dyeware Problem," the following remarks appeared in the "Yorkshire Observer" for March 3: The dyeware difficulty is being gradually modified. The output from the works of British Dyes Limited, of which Messrs. Read Holliday's works now form a part, has steadily increased, and is now quite double that of just before the war. It is fitting that contributions to the solution of the problem should emanate from Huddersfield, which now becomes the chief centre in the country of the dyestuffs industry. It will be remembered that Messrs. Lodge and Evans, of Huddersfield, invented a new dyeing process, of which some advantage has been taken. Now, it is reported, a new discovery has been made in connection with the production of aniline dyes; and this is likely to have an important bearing upon the work which British Dyes has undertaken. For some time past experiments have been carried out at the works of Messrs. James Robinson and Co., Limited, of Hillhouse Lane—one of the oldest colour manufacturing concerns in the country. These experiments have, it is claimed, been so successful that the firm are convinced of the utility of the new departure. Its possibilities cannot as yet be fully demonstrated, however, owing to the limitation of the supply of materials due to Government requirements for explosives. The nature of the discovery can only be vaguely hinted at. It lies in certain chemical processes which are constantly recurring in colour and dyestuffs production, and the operation is effected by hitherto unknown means. It is claimed that there will be a great saving in the cost of production, and that the discovery opens up a new method for the preparation of a new series of dyes.

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**South Metropolitan Gas Company's Lady Superintendent.**—The March issue of the South Metropolitan "Co-Partnership Journal" has, as a frontispiece, a portrait of Miss M. H. Fawcett, who, it is remarked, occupies a position which has been created by the circumstances brought about by the war. When it was decided that, during the absence of certain co-partners on Imperial service, some of the work of the offices and district should be done by women, Miss Fawcett, who was already an officer of the Company, was called upon to aid in the selection of suitable candidates, and subsequently to act as Lady Superintendent. In this capacity, she has the supervision of over 130 employees, of whom 45 are clerks, 17 are showroom assistants, 54 are index-readers, and the others are engaged in the maintenance, slot-meter, and chemical departments.

## WANDSWORTH, WIMBLEDON, AND EPSOM GAS COMPANY.

The Half-Yearly Meeting of the Proprietors of the Company was held last Tuesday, at the Westminster Palace Hotel, Victoria Street—Mr. H. E. JONES in the chair.

The SECRETARY (Mr. Chas. W. Braine) read the notice calling the meeting; and the Directors' report and the statement of accounts were taken as read.

### EFFECTS OF THE WAR ON THE UNDERTAKING.

The CHAIRMAN, in moving the adoption of the report and accounts, said they met again with the war still fiercely raging. In the first place, he wished to tell the proprietors how the Company had so far been affected by the war. Their employees to the tune of 32 per cent. had joined the Colours. He was sorry to say the names of thirteen of the men were on the roll of honour, eleven were wounded, and five were prisoners of war. This, on the one side, was a proud position; on the other side, it was a sad record. The war had also thrown upon the Company many burdens and many difficulties. As gas proprietors, they all knew the story; it had been repeated at many gas company meetings. There was first the difficulty that had obtained of freights at anything like reasonable rates. This very common experience was not shared by the Company. For many years they had had their own ships; and fortunately their own Engineer was able, at the beginning of the war, to find them a spare ship. The two ships that they formerly had would not—owing to all the difficulties and obstructions caused by the war—have been sufficient; and they would have required 50 per cent. more power to accomplish the same duty as previously. The proprietors were also aware that the Company were in the honourable position of being able to furnish for the defence of the country some of the most important explosives; and this they had been doing for a long time past. Through the energy of their officials, he might say that within a week of the authorities intimating that they would require some of these explosives, they were extracting them by the use of some plant which they had available, and which their Engineer at once put into operation. At the present time, they were completing further plant for carrying out the process to a higher degree. He was glad to be able to say that they were getting the plant together without the intervention of contractors. They were building it on a plan which had been approved, and found most successful. It was that adopted by Mr. Charles Carpenter, D.Sc., the Chairman of the South Metropolitan Gas Company, and was a beautifully simple and efficient system. This plant would be in operation long before the next meeting of the proprietors, because it must be got together with despatch and with all sacrifice to enable the country to overcome the enemy. He was sure, he was speaking the sentiments of the proprietors when he said the Directors had not hesitated, and would not hesitate, to incur any expense, trouble, or sacrifice to help the Government in the defence of the country. He believed that he had told the proprietors on a previous occasion that their Engineer (Mr. Carr) was devoting a large part of his time in the service of the High Explosives Committee, of which Lord Moulton was Chairman, by visiting the gas-works in the South of England, for the purpose of seeing that they were efficiently working in the same direction as he (their Engineer) had been doing at the Company's works for a long time past. Though the Company lost the benefit of part of Mr. Carr's services, the country gained more than the Company lost. However, the rapid and efficient production of explosives was much more important than that the Company should make a larger profit or that the consumers should get the last "ounce" out of the gas. He might tell the proprietors, with regard to any profit that might attach to them from what they were doing for the High Explosives Committee, that the return from tar was rather less than this time last year, so that clearly there was nothing hanging to what they were doing in the interests of the country.

### SALE OF GAS AND INCREASED USE OF GAS-FIRES.

It would be seen from the report that the Directors recommended the full statutory dividend in accordance with the increase in price of gas that was made last year. The proprietors would no doubt be anxious to know how this profit had been made. In the first place, the sale of gas in the half year—in spite of the prohibition of lighting which not only interfered with the public lighting, but which prevented the traders presenting their goods in their shop windows in the customary fashion with a good light—exhibited an increase of ½ per cent. over the corresponding period of 1914. During the half year, they had connected a large number of new consumers—738—who would, under other circumstances, have given them a large increase in gas consumption. There was also the amazing fact that 2514 stoves had been added to the Company's services. Formerly they had only 63,000 stoves in use. To have had such a large increase falling upon them at a time when they were very much handicapped through shortness of labour, and when it was very difficult indeed to get stoves from the makers, proved that there must have been some extraordinary factor at work, and this factor he had not the slightest doubt was the high price of coal, and the apprehension that was felt by the public that they might not be able to get coal at any price, whereas they knew that, having a supply of gas in the house, they could with the assistance of the Company add stoves for heating purposes, and so make themselves independent of the cost, delay in delivery, and perhaps insufficiency of coal. This was one of the most remarkable effects of this flat depressing time of war. When the war was over, and in ordinary times—for this had been on the whole a mild winter, which he was glad of for the sake of the poorer of the people—this access to the appliances for burning gas for heating would have produced a large increase in the consumption, instead of the small fraction of increase he had mentioned.

### A LARGER PROFIT AND OTHER FINANCIAL FEATURES.

Now as to the dividend. The proprietors would find a profit of £38,863 had been made, against £26,400 in the corresponding period of 1914, when they were £10,000 short of the amount necessary to maintain their position, and pay the full statutory dividend. The proprietors would find that even last half year, they did not make sufficient to pay the full statutory dividend by £5000, so that even the £12,450 surplus did not really quite meet the whole deficit of the previous two half years. Until they raised the price of gas 4d., they were selling gas below its real value; and nobody could look upon their dividend as anything but a fair return on their small capital. This result had been accomplished—and this he was always anxious the proprietors should understand—without any parsimony, or cutting-down of the cost of repairs. For the repair and maintenance of the works and plant, they had spent £24,700, against £21,125 in the corresponding period of the previous year. But, comparing these two figures, it must be remembered that everything in the way of material was now much dearer, wages were higher, and labour was difficult to get. It would also be recollected that they had a suspense account for obsolete retorts, which stood in the December half of 1914 at £12,400, and in the present accounts at £7440; so that they had been able to pay off some of the suspense obligation in respect of the replacement of obsolete plant by modern plant. In the distribution items of the account, the repairs, maintenance, and renewals had been well kept up; and the expenditure in these directions had amounted to a considerable sum—over 10d. per 1000 cubic feet of gas sold. They were in the position of having uncompleted works; and although they tried very hard to avoid having extra labour and expenditure, they had to finish the jobs that were in hand at the time the war broke out, and which were not completed at the end of June last.

### CAPITAL EXPENDITURE—MOTOR WAGGONS AND BARGES.

Some features of the accounts, he thought, would give the proprietors pleasure. In the capital account, there was one item for land, £2138. This land adjoined their Epsom works. The estate came into the market, the extent of the land being some 2½ acres; and it had upon it a convenient house, which would save the Company providing one for their manager there. For such an area, the amount of money expended, he thought the proprietors would agree, was extremely moderate, and that the purchase was a very proper one for the Board to have made, especially as it consolidated their works area and position at Epsom. It happened to be land scheduled in their Act of Parliament; and it was a curiosity of former legislation that they should have obtained power to make gas on land that did not belong to them. Parliament did such things years ago, but not now. On new buildings and plant, they had only spent £2098; but a large item was that for meters and stoves, £7368. Then there was a charge of £2200 for waggons and motors, and £6452 for barges. He might say here that one of the features of the Company's practice and economies, was the large amount of mechanical transport plant and barges which they now had. The proprietors knew that the Company were unique in having their own ships, which would pass right up the Thames from Newcastle. In connection with these ships, they had a fleet of large barges. These were bought thanks to the acuteness of their Engineer, who discovered there were some large barges for sale in Holland (where there was no use for them during the war); and he purchased them at a very reasonable price—at about half what they would have cost to build here. This, therefore, might be regarded as a very good investment. With regard to mechanical transport, they carried their coals direct from Wandsworth to both the Epsom and Mitcham works; and this was really the only way they could have economically kept the Mitcham works alive. When they were discussing their last Act of Parliament, it was quite on the cards that they would have to close the Mitcham works; but they had been saved by the transport of coal by waggon motors. With regard to the waggon motors and barges, he might mention that they were all met by a sinking-fund, and were not allowed to depreciate. The Directors were especially looking carefully at the question at the present time, to see whether or not they should set by a larger amount to the sinking-fund, so as to make it quite safe, seeing that motor waggons and barges were not quite such permanent matters as land and buildings. The Board had no reason to believe that these possessions stood in their books at above their value; as a matter of fact they believed they had improved in value, owing to the work that had been done upon them.

### THE RESIDUAL PRODUCTS.

Concerning the residual products, with the exception of tar (upon which they were supposed to make a large profit, but did not), the income showed an improvement. The receipts amounted this year to £63,837, as compared with £46,600 in the corresponding half year. The improvement chiefly arose from coke, because the price of coal had gone up so considerably that the poor people were glad to buy coke at a higher price than before; and the industries in the Company's area which formerly used coal were now using coke. Tar gave them an income of £7150, against £7349. So that, though they had by the tar taken something out of the gas for making high explosives, this at any rate had not added anything to the receipts; and the Board did not think this was material, so long as they furnished the Government with what they required. Turning to the balance-sheet, sundry stocks and stores were down from £28,000 to £18,000, although coal and oil had risen from £11,000 to £29,000. This was very fortunate; but if they had not had their third ship, they would not have got in stock the quantity of coal they had done, which placed them in a position of safety.

### PROFIT-SHARING, COUNTRY-SERVING EMPLOYEES, WAR BONUS.

He must for a moment return to the expenditure, to point out that profit-sharing called for £2100, against £2500. This was due to the price of gas having been increased, because, while this reduced the dividend, it also lessened the employees' bonus. But he was proud to say it still left a considerable amount for the men. In the comparative analysis which Mr. F. J. Bradfield, the Secretary of the Commercial Gas Company, published in the "JOURNAL OF GAS LIGHTING," the profit-sharing charge of this Company worked out to the very respectable item of ¼d. per 1000 cubic feet, whereas in some of the companies that had raised the price of gas more than this Company had done, the charge was considerably less—not much more than half the amount mentioned. The allowances made by the Company to the dependants of their employees on active service amounted to £3482; and assistance in the way of extra food allowance owing to war prices, and a contribution towards the support of Belgian refugees, amounted together to

£4478. These three charges made £7961, which sum went a long way towards the amount now required for dividend. He thought the proprietors must be gratified to feel that the business of the Company was of a character that enabled them to so far supplement the income of those who were left behind by the brave fellows who had joined the Colours, as well as to help the employees generally during this time of dear provisions. He had nothing more to say, except to mention that the officers, their staffs, and the employees had been doing their duty in the most exemplary manner. They had been working short-handed in the clerical department, which was the reason that the accounts could not be got ready at the usual time, and that the meeting was being held a little later. It would be realized that every man in the Company's service was doing his "bit" towards carrying on the war. Although they did not all bear arms, they were making shells and the explosives for filling them. Their officers and men in the country's emergency had indeed put forward their best efforts.

The DEPUTY-CHAIRMAN (Mr. R. Garraway Rice) seconded the motion.

Major LINDSAY-DAVIDSON (King's Own) said, with regard to the question of freights, he was glad to find the Board had adopted such a far-seeing policy as to secure for the Company their own ships for the transport of coal to the works. It did seem to him to be a disgraceful thing that, while the Company and others were doing their best for the country in connection with the war, certain traders were taking advantage of it to attain their own ends. He hoped the Directors would put this matter before the proper authorities, and help in the movement to try to get a reduction of freights. He should like to know how many employees were serving with the Colours.

The CHAIRMAN said about one-third, or nearly 400. He agreed with the sentiments of the proprietor as to traders taking advantage of this dreadful emergency for making undue private profit. This not only applied to shipowners; there were other people connected with supplies who did not seem to be working quite so well as they might do in the country's interests. The Directors all shared with Major Lindsay-Davidson the heartiest contempt for these practices.

Major LINDSAY-DAVIDSON said he believed some of the companies were working together in the attempt to bring down the rates of freight.

The CHAIRMAN: That is so.

The motion was unanimously carried.

### THE DIVIDENDS AND RE-ELECTIONS

The CHAIRMAN moved the declaration of dividends at the statutory rates per cent. per annum: On the Wandsworth "A" stock, £7 17s. 6d.; on the Wandsworth "B" stock, £6 7s. 6d.; on the Wandsworth "C" stock, £5 10s. 3d.; on the Wimbledon stock, £5 15s.; on the Epsom stock, £6 7s. 6d.; and on the new ordinary stock, £5 10s. 3d.

The DEPUTY-CHAIRMAN seconded the motion, which was unanimously carried.

Moved by the CHAIRMAN, and seconded by Mr. T. A. IVES HOWELL, the retiring Directors (Messrs. R. Garraway Rice, J. B. Howell, F. H. Jones, and B. R. Green) were re-elected.

Proposed by Mr. HENNELL, and seconded by Mr. W. RICHARDS, the retiring Auditor (Mr. E. L. Burton) was re-appointed.

### VOTES OF THANKS.

The CHAIRMAN, in proposing a vote of thanks to the officers and employees, said he wished to supply an omission in his speech. It would be within the recollection of the proprietors that at a previous meeting there was some discussion as to the Company's investments and their depreciation. While he (the Chairman), as he told the proprietors, was at the time against making any change, there afterwards came the proposition of the Government to issue War Loan. As the Company were helping the Government in every way, the Directors thought they could not do better than take up some War Loan. A little was bought outside to qualify them for converting the 2½ per cent. Consols into 4½ per cent. War Loan in two particulars—the reserve fund and the special purposes fund. This cost them a loss on the face of the thing of £5702 in one case, and in the other of £1244. If the opportunity again offered, the Directors would not put the funds into these investments. They had plenty of room for funds of this kind in their own business, in which they could allow 5 per cent. interest without any depreciation; in future they would follow this line. But this was a proper occasion for taking up War Loan, and getting rid of the depreciated Consols. He proposed to have the figures conserved as to the losses sustained by this transaction; for it was just as well to let everybody at all times know how much the fall in public confidence cost the Company. This loss was not due to the Board; and if the proprietors wished to blame anybody they must walk across the road to the Houses of Parliament. He now asked them to pass a hearty vote of thanks to the Engineer and the Secretary, their staffs, the foremen superintendents, and the workmen.

Mr. T. R. PORTER asked that, as they had all been working together under exceptionally difficult circumstances, the Chairman and Directors should be included in the same resolution. As the Chairman could not propose this, he would do so.

Mr. J. C. POTTER seconded Mr. Porter's suggestion; and, in the amended form, the resolution was heartily agreed to.

The CHAIRMAN, in reply, said his colleagues and himself very much appreciated the approval of the proprietors; and they would continue to do their very best through these troublous times.

Mr. BRAINE also expressed, on behalf of his staff and himself, gratitude for the confidence the proprietors showed in them.

Mr. CARR, in his acknowledgment, said he could assure the proprietors that the staff and workmen worked well in the best interests of the Company in these very strenuous times. The employees would all be pleased to read the kind expressions of appreciation that had been made at the meeting.

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In appreciation of the services of their Gas Manager (Mr. C. Parkinson), who has effected many improvements and reduced working expenses, the Dalton Gas Committee, at their last meeting, decided to increase his salary to £150 per annum, to date from Jan. 1 last.

## BRIGHTON AND HOVE GENERAL GAS COMPANY.

The Half-Yearly Ordinary General Meeting of the Company was held on Friday, at the Offices, No. 5, Great Winchester Street, E.C.—Mr. A. M. PADDON, the Chairman, presiding.

The SECRETARY (Mr. E. L. Burton) read the notice convening the meeting; and the report—*ante*, p. 497—and statement of accounts were taken as read.

### THE SPEECH OF THE CHAIRMAN.

The CHAIRMAN, in moving the adoption of the report and accounts, said the former document would have shown the proprietors that the Company had had a satisfactory extension of business at a time when very many undertakings were compelled to declare a decrease.

### A REFERENCE TO MR. JOSEPH CASH.

Intimation was made in the report of the accession to the Board of Mr. Joseph Cash. He (the speaker) felt perfectly certain that all the proprietors would welcome Mr. Cash in the same cordial spirit that his colleagues on the Board had done. ["Hear, hear."] Mr. Cash's connection with the Company had existed for well over fifty years, and for thirty years he had acted as Chief Engineer and General Manager. It would be obvious that the value of his experience to the Board was considerable; and on this account alone, his presence as a Director was a distinct gain to the Company. They would all wish him the enjoyment of many years in the discharge of his new responsibilities.

### THE ACCOUNTS.

Turning to the accounts, it would be noticed that they had powers with regard to the future issue of capital amounting to nearly £100,000 of ordinary stock, and some £32,000 of loan capital. The Board did not, however, contemplate availing themselves of either of the opportunities disclosed by these figures. In the aggregate, the capital raised—£703,378—represented £463 per million cubic feet of gas sold; and this was the lowest figure at which it had ever stood in the history of the Company. He had been able to make an announcement in these terms for a succession of half years; but he was afraid this was the last occasion for some little time to come upon which he would be able to congratulate the proprietors on the lowness of the capital, because they could not anticipate any further increase in the business, and the opportunity given to the Company by Parliament of revising the capital by buying and extinguishing their own stock must necessarily be brought to a standstill by existing circumstances. Capital expended during the half year amounted to £2840; and of this £2625 had been written-out by way of depreciation. So that they stood in much the same position with regard to capital, with the additional benefit of the extension of business noted in the report.

### SALES AND WORKING RESULTS.

On the credit side of the revenue account, it would be seen that they had sold 735,123,000 cubic feet of gas, and this was an increase of 17,871,000 feet, equal, roughly speaking, to 2½ per cent. This increase did not represent adequately the extension of the Company's business which had occurred, because the consumption for public lighting had, owing to the closure put in force by the authorities, fallen off to the extent of 16,000,000 feet. Therefore they might say that in normal times of lighting their increase during the half year would have been more like 33,000,000 cubic feet. The reduction in the use of gas by the curtailment of public lighting would be understood when he told them that there were 2345 street-lamps less burning to-day than was the case a year ago. Meter-rents had brought in £5107, or £521 more. This might not be a big figure, but it was a significant one, because it was just the increase in meter-rental which indicated the genuine expansion of the business. The total rental for gas, meters, stoves, and fittings was £12,169 more. For residual products, they had obtained an increase of £4749 (over 20 per cent.), which was eminently satisfactory. The gas sold per ton of coal carbonized during the half year had been 13,168 cubic feet. The proprietors would recognize that this was an extraordinary figure. He had come across one or two isolated cases in which it was exceeded; but it was really an extraordinary figure, and it was one which would stand the closest possible scrutiny. The measurement of gas at Brighton, and the methods employed for ensuring absolute accuracy, were complete; and there was no possible qualification of the figure by any contemporary processes on the works. The unaccounted-for gas amounted to only 5·56 per cent. Of course, theirs was not a Metropolitan district. In many parts it was semi-rural, and in some altogether rural; and in these circumstances one looked for an increased ratio of unaccounted-for gas. Considering the extended area over which they had to distribute the gas, they would agree with him that the figure he had quoted reflected a great deal of credit on the executive.

### EXPENDITURE ON REVENUE ACCOUNT.

On the debit side of the revenue account, coal, oil, and coke, added together, had cost nearly £6000 more, and wages £593 more. In their case, as in others, war bonuses entailed a special addition to the latter figure, and defeated all comparisons with pre-war periods of administration. He would call particular attention to the figures for repair and maintenance of works, mains, meters, and fittings. On the repair and maintenance of works they had spent an amount equal to 3·31d. per 1000 cubic feet of gas; on mains, &c., 2 81d.; on meters, just over 1d.; and on stoves and fittings, 3·77d. This was a total of just under 11d. per 1000 cubic feet, which was a fully adequate figure for a Company of their size. And when it was remembered that they had always kept their plant well maintained, and had always written what he might call the wasting assets down to the lowest possible figure, then the 11d. became even more important. It represented the continuation of a process that had been going on for many years. There was an item for insurance amounting to £878, which included protection against aircraft and bombardment—in fact, everything they could ensure themselves against. The figure for superannuation of officers was more; but it had to be taken in conjunction with the difference in the salaries that used to be paid to the older officers who had retired (and were receiving allowances), and those paid to their successors who

had shorter periods of service to their credit. Allowances to dependants of employees serving with the forces came to £1386, or an increase of £293. But this no one would begrudge.

EMPLOYEES AND THE WAR.

In the matter of these allowances, the Board had tried to treat the employees liberally. They had endeavoured to make the task of the Government as easy as, in their small compass of opportunity, they could; and a very large percentage of the employees were serving their country in this crisis. He did not think the Company had sought to avail themselves of the exemptions which one heard so much about. It seemed to him that the gas industry in very many instances had availed itself to an unjustifiable extent of the opportunity for holding back men from the forces. In their own case, they had had to have recourse to female labour; and experience had shown them that very much of the work that had to be done could be performed exceedingly well by women. Gas companies should do all they could by replacement in this way before advocating the wholesale wearing of badges, and asking the Government to assist them in keeping the business going. The profit and loss account disclosed the important fact that, whereas there was brought in £36,613, there was taken over £41.200, after having satisfied every possible demand. To the benefit fund there had been transferred from revenue account £883, while the requirements of the fund had only called for the disbursement of £583. The balance carried forward on account of this fund was £2685, which seemed much larger than the immediate needs would justify; but looking ahead, when the war came to an end there might be a great deal for them to do out of the fund for those who had returned from making their great measure of sacrifice for the country. If, therefore, it was possible to accrete money at the present time, the Directors felt they ought to do it. From the balance-sheet, it would be noticed that the investments of the reserve, special purposes, and benefit funds figured at £75,999, and that their estimated value at Dec. 31 was £75,710. By their last Act of Parliament, they were able to apply the reserve fund to the authorized dividend; whereas before they could only apply it to the standard dividend. This was a distinct gain from the proprietors' point of view. In a sliding-scale gas company, the reserve fund was, correctly speaking, the property of the proprietors; and therefore its availability to them should be as complete as it was possible to make it by Statute, which was the case here.

THE COAL PROBLEM.

As to the future, he did not expect the next accounts would be as favourable as the present ones. There was not an adverse circumstance or condition that would not be accentuated during the current six months. They would have to deal with dearer materials all round; but, as ever, coal would be the chief difficulty. The Company had been most loyally and efficiently served by their Contractors, Messrs. Stephenson Clarke and Co. Through all this trying period, they had been most devoted and most assiduous. They had spared the Company every possible evil consequence that could be avoided, by their tact and their knowledge, which was almost unexampled. They had assisted the Directors in every way, and had lightened the burden so far as they could do so. But they were not coal proprietors in their relations with the Company, and behind them lay the great difficulty—the difficulty which oppressed the whole country to-day. Contrast for a moment the responsibility of a gas undertaking as compared with that attaching to the supply of coal. To-day gas undertakings did not stand in a class apart. They were like electric and water undertakings and the great transport enterprises. All were strictly limited and regulated by Government enactments; they worked within a narrow circle of Government restriction and supervision. This was because they were supplying what was tantamount to a public necessity. But in the case of all these four branches of industrial activity, the supply of coal was all-important. The Prime Minister had said that the supply of coal was the life-blood of the nation; but he seemed to have left the subject severely alone after this comment. It was the life-blood of the nation; and it was utterly unregulated. This state of affairs it seemed to him could be altered. Speaking with a not inconsiderable experience of private and public legislation—that was the method by which the regulated industries he had referred to had been given their charter—he did not think there would be any serious practical difficulty in bringing the coal supply of the country under statutory limitations. From a practical point of view, it would be possible; but politically, of course, he could not pretend to say.

The DEPUTY-CHAIRMAN (Mr. G. W. Carey) seconded the resolution.

Mr. W. A. HOUNSOM said they knew the unique experience of Mr. Cash, and hoped his services would be at the disposal of the Board for very many years to come. At the same time he was glad to see that, by Mr. Rutter's appointment to the position Mr. Cash had vacated, the link which was broken when Mr. Rutter's grandfather passed away had been re-forged. He hoped he might have a long and useful life in connection with the Company. As to coal, the railway companies were learning something of what could be done by co-operation; and it might be that after this terrible crisis they would all carry on their business in a wiser manner—by co-partnership, co-operation, and fusion of interests.

Mr. S. SPENCER, after remarking on the excellent working revealed by the Chairman's speech, said fifty years ago one used to get coal at about 5s. per ton, for which it was now necessary to pay 26s.

The CHAIRMAN, after replying to a number of questions, said the Board certainly anticipated from Mr. Rutter services something of the kind which his grandfather rendered to the Company many years ago. They appointed Mr. Rutter because they believed him the best man for the work.

The resolution was then unanimously carried.

CONCLUDING BUSINESS.

On the motion of the CHAIRMAN, seconded by Mr. A. F. PHILLIPS, dividends were declared (less income-tax) for the half year at the rates per annum of 6 per cent. on the "B" preference stock, 4 per cent. on the "C" preference stock, 10⅜ per cent. on the original ordinary stock, and 7⅞ per cent. on the "A" ordinary consolidated stock.

Proposed by the CHAIRMAN, and seconded by Mr. PHILLIPS, Mr. Carey was re-elected a Director; and, on the motion of Mr. SPENCER, Mr. William Cash was re-appointed as Auditor. On the proposition of Mr. F. E. PILLEY, Mr. Cash was also appointed Special Auditor, in conjunction with the Special Auditor appointed by the Corporation of Brighton.

The CHAIRMAN proposed, Mr. SPENCER seconded, and the meeting cordially passed, a vote of thanks to the officers for their services during the past half year.

Mr. BURTON and Mr. RUTTER responded. Mr. Rutter mentioned that the number of men serving with the colours (out of 800) was 359. Three had been killed, five wounded, and one was missing. The proportion who had joined was 45 per cent., which was a figure to be proud of. It was rather over eighty years since his grandfather was appointed Engineer to the old Company; and from that time to this there had always been a Rutter connected with the Brighton Company, except for five years when he (the speaker) was with the North Middlesex Gas Company. It would be his endeavour to emulate his grandfather in the care and attention which he gave to the business of the Company.

The meeting closed with a hearty vote of thanks to the Chairman and Directors, on the proposition of Mr. G. CRISPE WHITELEY.

## NORTH MIDDLESEX GAS COMPANY.

### A Golden Opportunity for Gas Companies.

The Half-Yearly Meeting of the Company was held on Monday of last week, at the Offices, No. 5, Great Winchester Street, E.C.—Mr. A. M. PADDON, the Chairman, presiding.

The SECRETARY (Mr. Ernest L. Burton, F.S.A.A.) read the notice convening the meeting; and the report of the Directors and the statement of accounts were taken as read.

THE CHAIRMAN'S SPEECH.

The CHAIRMAN said the leading matters of interest were, shortly, that, in times of exceptional difficulty, the Company had succeeded in maintaining, and even slightly extending, the volume of their business, and also in paying the same dividend that obtained in the happier days before there was a war. Running briefly through the accounts, it would, in the first place, be seen that they had still a considerable amount of capital to issue, when it might be desirable to do so; but as matters now stood, of course, this was not a policy which a company would readily adopt. These were days in which it was necessary to restrain their activities as much as possible, and refrain from making demands on the public which they knew would not be met in the satisfactory way they formerly were.

THE CAPITAL ACCOUNT.

Consistently with this policy of economy, it would be observed that in the six months ended Dec. 31 the Company had only expended £466 on capital account; and they had eliminated £325 of this by depreciation. So that, while there had been some increase in the business, the capital had remained *in statu quo*. The total capital received for the purposes of the undertaking amounted to £689 per million cubic feet of gas sold. This was a much higher figure than had obtained in recent years; and the Directors were sorry that it was higher. But, nevertheless, one could not consider a figure like this by itself. It had to be taken in connection with the assets of the Company, with the value of the works, and with the efficiency of the works. The assets had been very considerably enlarged within recent years. The Company possessed a great deal of land for an undertaking of this size; and the land must go on increasing in value—which could not be said of all other kinds of assets. In the next place, they had just completed the renovation and the reconstruction of their works, bringing them up to the most approved form in existence. The balance of capital in hand was shown as £32,236; but this was qualified by the statement in the balance-sheet which showed that of it they required some £19,450 for the purposes of the prepayment installations. This was kept as a floating sum, which varied from half year to half year. He might say that, although the business was larger than six months ago, yet the amount of capital utilized in this all-important department had decreased by £1600. This showed that they kept this particular form of plant, which really were implements, written-down to the lowest possible figure; so that the position in this regard improved steadily from half year to half year.

LAST HALF-YEAR'S BUSINESS.

Looking at the revenue account, coal, oil, and coke had cost £2374 more. This was not a very great deal; and it would indicate to the proprietors that the Company had not as yet met the full impact of the increase in prices which obtained at the present day. Some remnants of the cheaper contracts had come forward for use during the past six months; and it would therefore be in the future rather than in these accounts that they would have to look for the figures which would represent the tremendous increase in the cost of materials which they all knew existed. On repair, maintenance, and renewal of works and plant, there had been spent over 4½d. per 1000 cubic feet of gas. This item and the similar allocations for mains and service pipes, meters, and stoves and fittings, were of crucial importance in a revenue account, because they represented the sums devoted to maintaining and improving the plant, and keeping it in proper order as a profit-earning machine. These four items stood at a more ample figure than they had hitherto reached in the history of the Company. It was a policy which he ventured to think was absolutely the correct one at times like these, that they should not allow themselves to come within measurable distance of estimating the profit until everything had been done that could be done in order to maintain the whole of the works, &c., at the highest possible point of profit-earning power. The Company were insured against damage by air-craft. Some eighteen months ago, there might have been uncertainty as to the expediency of this; but he thought by now they had all been educated past this point, and that it would not be wise of any gas company in this quarter to neglect to

make due provision for contingencies of this kind. Bad debts were only £52 more; and the figure this item stood at was largely due to the fact that they were making in these accounts ample provision for anything that might come upon them by reason of worse times ahead. Up to the present, the collection had not been more difficult than hitherto; but though they had passed through some evil days, there were worse to come, and it was wise to take precautions. There was an allowance of nearly £500 for dependants of employees serving with the forces. This was an increase of £240 over a year ago; but he was quite sure the proprietors would be in full sympathy with any allocation of this kind, to assist the brave men who in the early stages of the war went forth to do their duty. On the credit side of the revenue account, they had sold 3,432,000 cubic feet more gas, which represented an increase of roughly 2¼ per cent. Gas, meter, stove, and fittings rental brought in just over £2000 additional—charging 3s. 4d. per 1000 cubic feet, as against 3s. 2d.

CONCEPTIONS OF DUTY.

While they had only increased their charge 5 or 6 per cent., they had to meet an increased price of coal of from 35 to 40 per cent.; and almost every other commodity was being pushed up in a similar way. If gas companies had not a better conception of their duty to the public than had sellers of coal and owners of ships, the public would be in a very bad way indeed. Of course, gas undertakings were not philanthropists. The state of things they were dealing with that day would not, he hoped, be a permanent one; and he ventured to think the consideration which gas companies were now showing for the difficulties of their consumers would bring them in a very useful return in the future. After all, they had to remember that their commercial competition now was more with coal as a fuel than it was with electricity as a light. Gas was so much the cheaper as an illuminant that variations in price would not make much difference. Their real contest was in getting people to understand that gas was more convenient and economical than coal for heating purposes. This was a golden opportunity for them to show it; and by increasing the price of gas to the small extent they had done, they ought to establish a preferential position in the public esteem and regard which would do very much to advance their business in the future. For residuals they had received about £1560 more.

FUTURE PROSPECTS.

The total receipts were £3574 more, and the expenditure £4479 more. The profit amounted to £5617, which was £904 less than was the case a year ago. After paying the dividends for the previous half year, there was left £3967; and adding to this the present profit and interest, gave £9602. There would, after interest and income-tax charges had been paid, be a sum of £8548; and when the present dividends were paid, there would remain an amount of £3174 to carry forward, or £793 less than was brought into the account. But when they considered the maintenance items in the revenue account to which he had already referred, they would see that this reduction was fully accounted for. This maintenance charge altogether was no less than 1s. 3½d. per 1000 cubic feet of gas, which they would agree was a very healthy condition of affairs. As to the future, there was not the slightest doubt that the difficulties before them were far greater than those that had already been surmounted. The cost of coal was going to be very considerably increased over what it was now; and they could not expect to derive from residuals very much more than they were doing to meet the increase. In fact, in certain directions they must look for a diminution in the receipts from residuals. It could hardly be expected that tar would give them as much as it had done in the past; while coke could give them very little more. They had worked up the efficiency of their plant, as he had said, to the highest possible point. But they ought never to be at the end of their resources with regard to economy; and he thought they had succeeded in the past in showing what could be done by assiduous endeavour, and by the technical knowledge so amply represented on the Board. He trusted they would be able to deal with matters as they arose. Though the proprietors must not expect that in existing circumstances the present state of prosperity could be indefinitely maintained, yet he thought for some half years to come the Directors would be able to look after them with respect to dividend. After this terrible cloud had passed, they would no doubt reassert themselves, as in the old days, as a first-class profit-earning undertaking. He concluded by moving the adoption of the report and accounts.

Mr. H. A. LERMITTE seconded the resolution, which was carried unanimously.

On the proposition of the CHAIRMAN, seconded by Mr. A. F. PHILLIPS, dividends for the half year were declared, less income-tax, on the preference capital at the rate of 5 per cent. per annum, on the original ordinary capital at the rate of 11 per cent. per annum, and on the additional ordinary capital at the rate of £7 14s. per cent. per annum.

The re-election of Mr. Paddon as a Director was agreed to, on the motion of Mr. LERMITTE, seconded by Mr. S. A. SAMPSON; and the Auditor (Mr. L. Hardy) was also re-appointed, on the proposition of Mr. C. H. RUTTER, seconded by Mr. WILLIAM RICHARDS.

The CHAIRMAN proposed a hearty vote of thanks to the officers for their very successful efforts on behalf of the Company during the past six months.

Mr. F. J. BANCROFT, in seconding, remarked that, as an officer of a neighbouring Company, he could personally testify to the excellent manner in which the work of the North Middlesex Company was carried out.

The vote was cordially passed, and acknowledged by Mr. LAWRIE TREWBY (the Engineer) and Mr. BURTON.

A similar vote of thanks to the Chairman and Directors concluded the proceedings.

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The annual financial statement submitted to the Belfast Corporation shows grants from the Gas Department for £11,400 for payment of interest and sinking fund on the cost of the new City Hall, and £5000 for the relief of rates. The Electricity Department made a grant of £5000.

## BARNET DISTRICT GAS AND WATER COMPANY.

### An Anxious Outlook Regarding Coal.

The Half-Yearly Meeting of the Company was held on Monday of last week, at the Offices, No. 139, Cannon Street, E.C.—Mr. A. F. PHILLIPS, the Chairman, presiding.

The SECRETARY (Mr. Ernest W. Drew, F.C.A) read the notice convening the meeting; and the Directors' report and the statement of accounts were taken as read.

The CHAIRMAN, on rising, expressed regret at the unavoidable absence of the Deputy-Chairman (Dr. J. W. L. Glaisher) and of Mr. Samuel Cutler. Proceeding to move the adoption of the report and accounts, he said that in the six months ended Dec. 31 there had been no addition to the gas capital, and the only addition to the water capital was £163 for new mains. The result of the half-year's gas business was much the same as in the corresponding half of 1914. The sale of gas was only 750,000 cubic feet, or 0·77 per cent., more. What was gained from new private consumers was lost by the suppression of the public lamps and restricted shop lighting. Coal cost £7495, against £6508; and the increase in the quantity carbonized was 106 tons. As was mentioned in the report, the Company benefited to a considerable extent by contracts made before the war, so that the average increase in the cost was about 2s. 7d. per ton. During the current half year, revenue would have to bear the full cost of the increased price. Repairs and maintenance came out at £3229, as compared with £1386. This increase was due to part cost of replacing the present system of removing the coke from the retort-house with improved coke-conveyors. The charge for stoves and fittings was £1215, against £1535. The number of new consumers was less—probably to some extent due to so many fitters having enlisted. The reduction in the cost of the public lamps from £712 in 1914 to £259 on the present occasion was owing to the discontinuance of the public lighting. There was a new charge in the accounts—the war bonus allowance made to the staff and employees now serving with the forces. The sale of gas for private lighting realized £16,094, against £14,938; the increase being chiefly due to the extra 2d. per 1000 cubic feet of gas, which was charged from Lady-day last. Residual products realized £4475, against £3689; coke and sulphate of ammonia showing improvements, but tar a considerable falling-off. The other receipts and expenses corresponded with those of the previous year. The figures were given on the accounts; and it was consequently unnecessary for him to dea with them. The balance carried to profit and loss was £4593, as compared with £4745 in 1914. In the water revenue account, receipts and expenses being much the same, he need not call attention to them. As in the case of gas, there was a new charge of £244 for war allowances. The water delivered into the district was 400 million gallons, or 12 million gallons less than in the previous year. The pumping charges were only £155 more, which was satisfactory, considering the increased cost of fuel. It showed that the pumping plant had been maintained in an efficient condition. The domestic supply of water had been well looked after—the consumption amounting to only 19 15 gallons per head per day. The net water-rental showed a decrease of £223, due to less water being supplied for trade purposes, and the absence of building in the district. The balance carried to profit and loss was £14,636, against £14,978 the previous year. It would be seen from the profit and loss account that, after providing income-tax £2960, interest on debentures £1651, and carrying £2000 to the contingency fund, the balance available was £36,165, of which the proposed dividend would absorb £12,423, leaving £23,742 to carry forward. Throughout the half year it had required considerable exertion to obtain supplies of coal; and the future was full of anxiety, both as to supplies and price. The works had been carried on with difficulty, owing to the loss of many employees and members of the staff who had joined the army. Those remaining had, however, proved most loyal to the Company and attentive to their duties, fully maintaining the supply of gas and water.

Mr. ALFRED LASS formally seconded the resolution.

Mr. C. P. CROOKENDEN having remarked upon the excellent figure of 19·15 gallons of water per head,

The motion was unanimously carried.

Proposed by the CHAIRMAN, and seconded by Mr. J. E. PLUMMER, dividends were declared, less income-tax, for the half year, at the rate per annum of 9 per cent. on the "A" and "C" stocks, 8 per cent. on the "B" stock, and £6 6s. per cent. on the "D" capital gas and water stocks.

The retiring Directors (Dr. Glaisher and Mr. Plummer) were then re-elected, on the motion of the CHAIRMAN, seconded by Mr. J. L. CHAPMAN; the retiring Auditor (Mr. B. Dennett Holroyd), on the proposition of Mr. WILLIAM RICHARDS, seconded by Mr. F. R. SMITH.

The CHAIRMAN, in proposing a vote of thanks to the staff for their services during the past half year, remarked that they had worked exceedingly well, and been most loyal to the interests of the proprietors. The Engineer (Mr. F. J. Bancroft) had maintained the property in a very efficient state—which was proved by the fact that the sale of gas for the past six months was 13,200 cubic feet per ton of coal carbonized, and, as he had already stated, the water department was so well looked after that the supply was only 19·15 gallons per head per day. To Mr. Drew, also, they were much indebted. Other members of the staff had served the Company equally well; and he desired to include them all in the vote.

Mr. CROOKENDEN seconded the proposal, which was heartily agreed to, and acknowledged by Mr. BANCROFT and Mr. DREW.

On the proposition of Mr. SMITH, a cordial vote of thanks was passed to the Chairman and Directors.

The CHAIRMAN, in response, said that, considering the great addition to the cost of coal, the increase of 2d. per 1000 cubic feet to the price of gas was very reasonable. The Board trusted they would be able to maintain the undertaking in a satisfactory condition without making any further advance. He was, however, afraid there were still a vast number of people who did not realize the position in which they were placed, and how much the rise in prices of material had affected undertakings of this sort.

## COLCHESTER GAS BILL.

### An Agreement come to with Lexden.

Last Wednesday, at the meeting of the Lexden and Winstree Rural District Council, the Special Committee appointed to consider the provisions of the Colchester Gas Bill reported that they had had two interviews with the Solicitors and the Manager of the Company. They were unable on the first occasion to come to terms with the promoters, and accordingly gave instructions for a draft petition against the Bill to be prepared. The promoters' representative, however, asked for a second interview; and, as the result, the Committee had agreed to the following terms, which will be inserted in the clause in the Bill for the protection of the Council:

(1) Limiting the time for which the Company will have power, if they have not laid mains, in the parishes affected, for a period of five years after the war, at the expiration of which period they will not be entitled to lay their mains in any of the parishes after twelve months' notice from the Council requiring them to do so, and providing that the authorized undertakers may supply in such of the parishes as may be supplied by the Company after the period mentioned.

(2) Giving the Council the same protection in regard to the roads and bridges as will be afforded to the County Council.

(3) Limiting the price of gas in that part of the parish of Stanway which is situate within a distance of a hundred yards on either side of the London Road to the same price as that charged in Colchester.

(4) Limiting the price of gas in the parish of East Donyland to a price not exceeding 6d. more than charged in Colchester.

(5) Limiting the price of gas in the remainder of the parishes to not more than 9d. in excess of the price in Colchester.

The Committee's recommendation was adopted, that their action be approved and adopted, and that they be authorized to settle the draft clauses which have been submitted by the promoters.

## LIGHTING OF FACTORIES AND WORKSHOPS.

### The L.C.C. and the Departmental Committee's Report.

At to-day's meeting of the London County Council, a report of the Public Health Committee will be presented, dealing with the recently issued Departmental Committee's Report on Lighting in Factories and Workshops.

The Committee merely point out that the inquiry has practically been limited to the engineering, textile, and clothing trades. The evidence adduced shows that in modern factories good lighting is now regarded as one of the most important factors contributing to industrial efficiency, and that while there has been a great advance in methods of illumination, there is considerable need for general improvement, particularly in the case of old factories.

The Departmental Committee, it is mentioned, call attention to existing requirements which are alleged to have led to some difficulty in regard to the admission of adequate daylight to factory premises; and then point out that the Committee appear to be satisfied that inadequate lighting is a contributory cause of accidents, and the impression is conveyed that unsatisfactory lighting is prejudicial to health in various ways. It is also recognized that insufficient light adds to the difficulty of maintaining the premises in a clean and sanitary condition. Statutory powers are recommended (*a*) requiring adequate and suitable lighting in every part of the factory or workshop, and (*b*) giving power to the Secretary of State to make orders defining adequate and suitable illumination. The expression adequate lighting is explained as meaning, in workrooms, a minimum provision at the floor-level of the working parts of 0·25 foot-candle, in foundries, 0·4, and in the lighting of approaches, 0·1 foot-candle, with yard lighting equal to 0·05 foot-candle. No recommendation is made at this stage as to the special illumination required for executing the work. Suitable lighting is defined as the avoidance of glare and extraneous shadows and the obtaining of a reasonable degree of constancy and uniformity of illumination. The recommendations apply to both natural and artificial lighting. The Departmental Committee are awaiting more settled economic conditions before further prosecuting the inquiry; and the Health Committee state that—"There does not appear to be anything in the report which calls for action by the Council at the present time."

**Felixstowe Gas Company.**—The report adopted at the annual meeting of the Company stated that, while the gross revenue was higher than in the previous year, this had been secured at a very much greater cost for coal, labour, and materials of all descriptions. Dividends were agreed to making a total distribution for the year of 8 and £5 12s. per cent. respectively on the "A" and "B" stocks. In order to do this, it will be necessary to withdraw from the profit and loss credit balance a sum of about £200, which was a trifle more than was added to it at the end of 1914. The Chairman (Mr. E. Woodmancy) remarked that the actual sale of gas was about equal to that of the preceding twelve months. More was sold in the first half, however, at the 1914 price, and less in the second half, when the charge was 3d. per 1000 cubic feet more. The net cost of the gas sold in 1915 was 3d. per 1000 cubic feet more than in 1914; and seeing that they only got 3d. increase, and this on a considerably less output, it was obvious that they could not expect to show anything like the profit they usually had. It seemed a little strange that, when the Minister of Munitions had been recommending that everybody should use as much gas and coke as possible so as to enable gas companies to supply necessary materials for explosives, the War Office, when they had the chance of having gas in all their hutments, did not take it. If they had, it would have helped the Company, who would have been able to supply more coke at a less price than the War Office now had to pay in purchasing at a distance. The Government gave other people advice, but did not carry it out themselves.

## EDINBURGH AND LEITH GAS COMMISSIONERS.

### Works to be Placed under Government Control.

At the Monthly Meeting of the Edinburgh and Leith Gas Commissioners on Monday of last week, it was reported that the Stirling boiler attendants at the gas-works, not being satisfied with the Commissioners' decision in connection with the application for an increase of wages [*ante*, p. 321], had, on the 4th ult., threatened to leave work unless they received an advance of ½d. an hour in addition to the war bonuses. The matter was brought under the notice of the Lord Provost of Edinburgh; and he expressed the opinion that, inasmuch as the Government had expended a good deal of money in erecting plant at the works for the production of chemicals for high explosives, the Munition Authorities in London should be informed of the attitude of the boiler attendants. He advised that the Conveners of the Works and Finance Committees, along with the Engineer (Mr. Alexander Masterton) and the Clerk (Mr. J. M'G. Jack), should place the facts before the Munitions Department. This advice was carried out on the 8th ult. The deputation was received by Mr. Garrod, who informed them that an order was to be issued within a few days which would bring under the Munitions of War Act, 1915, and the Amendment Act, 1916, those gas undertakings that were assisting the Government in the manufacture of toluol, benzol, &c., required for the production of ammunition. Since the interview, Mr. Garrod had forwarded to the Commissioners certain regulations, the effect of which will be to bring their undertaking under control so far as the works and manufacture are concerned, but not as regards the financial side. Under these regulations, questions as to rates of pay and conditions of employment, failing agreement, will require to be settled by arbitration. The men had been informed that, if they withdrew their notice to cease work, the Commissioners would be prepared to concur with them in referring to an arbitrator, to be appointed by the Board of Trade, what rise of wages (if any) should be granted. The men had agreed to this proposal; and Sheriff Louttit Laing, of Aberdeen, had been appointed to adjudicate upon the question.

The Commissioners also had before them a request by the National Union of Corporation Workers that the additional war bonus recently granted to the permanent employees should be extended to temporary men; but, on the recommendation of the Works Committee, they decided not to comply with it. An application from the Edinburgh and Leith Master Plumbers' Association for an advance of 15 per cent. (to meet the enhanced wages of their employees) on schedule prices for fixing gas-fires, &c., was acceded to—the increase to take effect from Whitsunday next.

At a subsequent stage of the proceedings, it was announced that the following increases of war bonuses had been agreed to by the Commissioners:

(1) To all workmen whose wages or average wages at present amount to 20s. and up to and including 30s. per week (exclusive of war bonus and value of other concessions), an additional bonus of 2s. per week—making a total bonus of 4s. 6d. per week.

(2) To all workmen whose wages or average wages at present amount to 30s. and up to and including 35s. per week (exclusive of war bonus and value of other concessions), an additional bonus of 1s. 6d. per week—making a total bonus of 3s. 6d. per week.

(3) To all workmen whose wages or average wages at present amount to 35s. and up to and including 40s. per week (exclusive of war bonus and value of other concessions), an additional bonus of 1s. per week—making a total bonus of 3s. per week.

The foregoing enhanced war bonus is not to apply to the tradesmen enumerated below, who are at present receiving the recognized trade rates or their equivalents; nor is it to be applicable to any of the temporary or casual hands throughout the works or distribution departments: Bricklayers, joiners, turners, fitters, painters, masons, blacksmiths, brassfinishers, and plasterers.

The bonuses come into operation as from Nov. 15, 1915, and are not to affect any of the employees serving with the Imperial Forces. The total annual charge represented by the proposals will, it was stated, amount to £1580.

**Castleford and Whitwood Gas Company.**—The annual meeting of the Company was held on Monday of last week, under the presidency of Mr. Thomas Gill, J.P. In moving the adoption of the report and balance-sheet, the Chairman stated that the result of the year's trading showed a decreased revenue of £1059, and an increased expenditure of £982. The sum available for dividend (including the balance from the previous year, and after payment of the interim dividend in the first half year) amounted to £4924. Dividends at the rate of 11 per cent. on the original stock and 8 per cent. on the additional stock were declared, leaving a balance of £3214 to carry forward. During the year, Mr. Alfred Wilson, who had been the Secretary of the Company for 37 years, was elected a Director, and his son, Mr. H. L. Wilson, was appointed Secretary.

**Issue of Capital Authorized at Watford.**—At an extraordinary meeting, the Directors of the Watford Gas Company have been authorized to raise additional capital not exceeding £50,000, in such times and on such terms as they shall decide. This followed the ordinary half-yearly meeting, at which the Directors reported a decrease in the sale of gas, though, taking into consideration the reduction in lighting, the result was far from being unsatisfactory. The demand for gas fires and stoves was still increasing. There was an available balance on profit and loss account of £8548; and the full statutory dividends were declared. The Chairman (Mr. E. J. Slinn) pointed out that the co-partnership sum showed a reduction of nearly £70, which was a reminder that the forced increase in the price of gas hit the co-partner as hard as it did the shareholder, and very much harder than it did the consumer. They finished the half year with a good balance at the bank, and substantial stocks of all requirements, which would give a good start to the current half year, and so partially meet the ever-increasing prices of materials. Since the beginning of the war, 48 of the regular staff had enlisted, and eight of their casual employees.

## THE ROAD BOARD AND TAR PRODUCTS.

### Circular to County Authorities.

The following is the text of the circular which, as stated in the "JOURNAL" last week, has been issued by the Road Board to county authorities; it is dated the 25th ult.

I am directed by the Road Board to inform you that they have been in communication with the Treasury as to the policy to be observed by the Road Board in regard to applications for advances towards the cost of road-crust improvements to be carried out during the financial year 1916-17; and it has been agreed that new grants or loans, to an aggregate sum not exceeding £200,000, may be made out of the surplus at the credit of the Road Improvement Fund.

The grants and loans will be confined mainly to expenditure on tar treatment of important roads, either in the shape of surface dressing or pitch grouting or tar macadam. It has been brought to the notice of the Board by the Ministry of Munitions that certain products obtained from the distillation of crude tar are of great importance in connection with the supply of high explosives, and on this account it is desirable to encourage the use of refined tar by highway authorities. Apart from this, however, the Board consider that at the present time, when it is desirable to economize expenditure as much as possible consistently with adequate maintenance, a surface dressing of tar is generally the most effective and the cheapest method of preventing disintegration and thereby prolonging the effective life of a road crust, provided that the surface is in sufficiently good condition to justify the application of the tar dressing. The Board will require to be satisfied on the last-mentioned point in the case of each application for a grant. No grant will be made for the use of crude tar.

Applications for grants or loans should be sent forward at an early date, and should be accompanied by: (1) Particulars relating to the proposed improvement prepared in accordance with the enclosed memorandum and forms; (2) a summary of the highway estimates of the Council for 1916-17; (3) a statement on form attached showing the total expenditure on roads and bridges in 1914-15 and 1916-17 (estimated) in continuation of the information supplied to the Board on Yellow Form 42 "Information relating to the expenditure by county councils on road and bridges."

## FARMERS AND THE USE OF SULPHATE OF AMMONIA.

### The Government Price Objected to.

At a meeting last Wednesday of the West Riding of York War Agricultural Committee, held at Wakefield, a communication was received from the Ardsley District Sub-Committee as to the high price of sulphate of ammonia.

Alderman the Rev. L. B. Morris remarked that farmers were disposed to use sulphate, but the price was prohibitive.

The Chairman (Major J. W. Dent) observed that £16 10s. a ton was the price at which manufacturers were prepared to sell; and the Government had for the present stopped the export of sulphate, with a view to putting stocks at the disposal of farmers. The farmers naturally supposed that when the export was prohibited prices would fall materially; but they had not done so. Certain farmers' associations took the view that the Government should fix the price; but in a speech which he delivered to the Farmers' Union, Mr. Acland said farmers should be chary about asking for the price to be fixed, because if they had prices fixed for what they wanted to buy, they might find prices fixed for produce they wanted to sell. Makers of sulphate were already saying they could not hold their stocks any longer; and if they could not dispose of them they would have to shut-down production. It seemed, therefore, the only thing for farmers was to send in their orders, as there would be no official fixing of the price, and makers were strong enough to stand out against any reduction.

Mr. R. Garnett said it seemed that makers were taking advantage of the recommendation of the Board of Agriculture to farmers to use sulphate of ammonia. The farmers had to consider whether, at 16s. 6d. per cwt., it was a good commercial proposition from their point of view; and they were of opinion it was not. All the advice of Lord Selborne and the Government was not likely to be accepted by the farming community unless a lower price was fixed.

The Chairman thought that sulphate was worth trying, if used with care and discretion—even at £16 10s. a ton, having regard to the present prices of agricultural products.

No resolution was passed.

**Belfast Water Undertaking.**—Mr. F. W. M'Cullough, J.P., the Engineer of the Belfast Water Commissioners, delivered an address before the local Rotary Club, on "The Development of the Belfast Water Supply." He traced the history of the supply from 1613, when the place obtained a Charter from James I., down to powers being granted to the Commissioners' Board in 1840, and the extensions to Woodburn and Lough Mourne areas and further powers granted in later years. When all sections of the Mourne scheme were completed and developed, there would be, Mr. M'Cullough said, a total supply of about 33 million gallons per day for use in the city alone. The quantity would be more than double the daily amount now available from both the Woodburn and Stoneyford sources of supply. The Commissioners had already decided to proceed with the construction of the works included in the second section of the Mourne scheme, and the contract, plans, and specifications were now in hand for the proposed storage reservoir in the Kilkeel Valley, which would have a capacity of 3000 million gallons—in itself storing more water than all the fifteen reservoirs in the Woodburn and Stoneyford systems, and forming one of the largest storage reservoirs of an artificial character in the United Kingdom.

## CURRENT SALES OF GAS PRODUCTS.

### The London Market for Tar, Tar Products, and Sulphate.

LONDON, *March* 6.

There is little of interest to report in the London tar products market. Both in London and in the country increased attention is being paid to the question of the use of pitch for gas making, and it is quite expected that material quantities will be absorbed in this manner. Makers still quote pitch at 19s. to 19s. 6d. per ton f.o.b. works; but there is a reluctance to make offers for forward delivery. Creosote is in demand at 4d. to 4⅛d. net in bulk; while 90-160 solvent naphtha remains at 2s. 2d. to 2s. 3d. net and naked per gallon, in bulk at makers' works.

Sulphate of ammonia remains inactive pending the issue of export licences, and prices are nominally as last named.

### Tar Products in the Provinces.

*March* 6.

There is no alteration in the markets for tar products. Pitch remains in the same position. No business of importance is reported in creosote. Solvent and heavy naphthas are in good demand; but some business is reported in light solvent at slightly lower prices.

The average values of gas-works products during the past week were: Gas-works coal tar, 16s. 9d. to 20s. 9d. Pitch, East Coast, 15s. to 16s. per ton; West Coast, 14s. to 14s. 6d. Manchester; 15s. to 15s. 6d. Liverpool; 17s. to 17s. 6d. Clyde. Benzol, 90 per cent., North, 10¼d. to 11⅛d.; 50-90 per cent., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 3d. Coal tar crude naphtha, in bulk, North, 6½d. to 7d. Solvent naphtha, naked, North, 2s. to 2s. 1d. Heavy naphtha, naked, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, 2⅛d. to 2⅜d. Heavy oils, in bulk, 3⅛d. to 4d. Carbolic acid, 60 per cent., East and West Coasts, 3s. 4d. naked. Naphthalene, £18 to £28; salts, 80s., bags included. Anthracene, "A" quality, 2d. to 2½d. per unit; "B" quality, nominally ¾d.

### Manchester Tar Prices.

The average price realized for tar—based on the value of the products—for January deliveries, in the Manchester district, was 23s. 9d.

### Sulphate of Ammonia in the Provinces.

LIVERPOOL, *Mar.* 4.

There has again been a moderate amount of business doing, but the limitation of exports by the War Trade Department has precluded any great demand and any recovery in values. Consequently the quotations remain £16 17s. 6d. per ton f.o.b. Hull, £17 per ton f.o.b. Liverpool, and £17 5s. per ton f.o.b. Leith. Unfavourable weather has discouraged buying for home consumption, and no large amount of business in this department has transpired. Producers still maintain a conservative attitude in regard to the forward position; but there have been second-hand dealings at a premium of about 5s. per ton on prompt prices.

### Nitrate of Soda.

This article remains very firm at 16s. 10½d. per cwt. for ordinary quality. For refined, the price has been advanced to 17s. 9d. per cwt.

### Sulphate of Ammonia.

From another source it is reported that prices are slightly lower. Outside London makes are quoted at £16 to £16 2s. 6d.; Hull, £16 15s.; Liverpool, £16 17s. 6d. to £17; Leith, £17; Middlesbrough, £16 17s. 6d.

## COAL TRADE REPORT.

### Northern Coal Trade.

There is some irregularity in the demand for coal—owing to the varying supply of tonnage, and the stormy weather which has prevailed, with the delay of steamers. In the steam coal trade, there is a fair amount of fuel offering, and some buyers seem to expect lower prices. For best Northumbrian steams, the quotation is from 32s 6d. to 34s. 6d. per ton f.o.b., according to the time of delivery; second-class steams are from 28s. 6d. to 29s. 6d. per ton; and steam smalls are from 15s. 6d. to 17s. per ton—the latter kind being in rather better demand. Shipments are fair in the circumstances, for the delay of tonnage is affecting unequally the collieries. But output also varies; so that the price is a little more a matter of bargaining between the figures named. The gas coal trade is not quite so much affected, as more of the deliveries are on contracts, and the consumption, if decreasing, is still good for the time of year, and—apart from tonnage difficulties—the production is well taken up. Best Durham gas coals are about 25s. 6d. per ton f.o.b.; second-class gas coals, about 24s. to 25s. per ton; and "Wear Specials," 27s. per fon f.o.b., with a steady demand. But there are occasionally cargoes thrown on the market, through the non-arrival of tonnage that had been arranged for, which may at times be sold at slightly lower prices where prompt steamers can be guaranteed by the buyers. Little is doing in new contracts just at present; and foreign sales are only cautiously entered into. The freight market is very firm, and seems likely to continue so, for arrivals are rather slow. The rates of freight on gas coals are heavy. About 88s. is now quoted Tyne to Genoa, and 33s. to Rouen. So the cost of gas coal at these ports is very high indeed; and even at such a cost supplies are not always to be readily had. In coke, the inquiry is good, and the price is generally maintained. For export, good gas coke is now quoted at about 27s. 6d. to 29s. 6d. per ton f.o.b. in the Tyne; but heavy freights, of course, make the cost far above that usual, and may tend to limit the quantity sent abroad.

## Hastings and St. Leonards Gas Company.

Submitting the report and accounts for the half year ended Dec. 31 at the meeting of the Company last Thursday, Dr. G. G. Gray said there was little fresh he had to tell the proprietors. The same unprecedented state of affairs, and the same difficulties and high charges, still continued; and there seemed no prospect of their ceasing or even lessening in the near future. On the contrary, there appeared rather a prospect of their increasing. Owing to the lighting restrictions, the practice of economy, &c., there had been a considerable decrease in the quantity of gas sold, compared with the same half of the previous year. But though they had sold less gas, they had received an increased return; and, on the other hand, though they had made less gas, it had cost them considerably more. The increased cost was seven times as much as the increased return. Of their employees, 42 had joined the Forces; and the Engineer (Mr. C. F. Botley) had directly or indirectly kept in touch with practically the whole of them. The report stated that the accounts showed a profit balance of £10,259, which, with £331 from the balance brought forward, would provide for standing charges and enable the statutory dividends to be paid. The demand for gas appliances was, in the circumstances, well maintained. The cost of all stores, labour, and raw material had still further increased; and, chiefly owing to freightage, it had been difficult to get adequate supplies. The price of gas had had to be advanced as from Jan. 1 a further 3d. per 1000 cubic feet. Mr. James T. Piper, the Accountant, after 58 years of faithful service, had relinquished his more active duties; and Mr. S. Taylor, who has been with the Company for many years, had been appointed Chief Cashier.

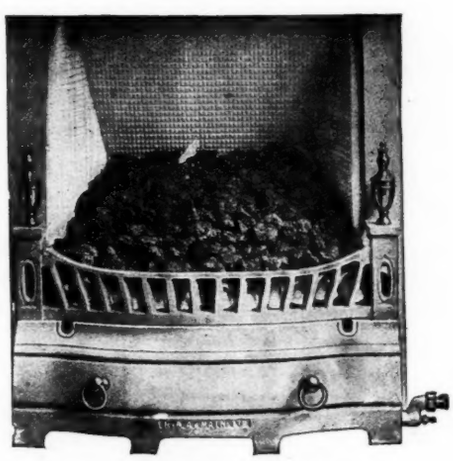
**Dividend Distribution at Harwich.**—Referring to the question of dividend at the annual meeting of the Harwich Gas Company, the Chairman (Mr. H. J. W. Jervis) remarked that a reduction in consumption of 3 million cubic feet dissipated all hope of maintaining the net profit. The Directors felt justified in recommending a final distribution at the rate of 8 per cent. for the year on the original shares and £5 12s. on the new shares, in view of the fact that, after payment of the interim dividend, there remained at the credit of profit and loss account the sum of £5708, accumulations of former year's earnings. It might be said they could have paid the usual full dividends; but they were of opinion that in these times it was only proper the shareholders should shoulder some of the obligations of the war. Better times would come again. There was nothing that need cause any shareholder apprehension as to the stability of his investment. When the world was held in thrall by the mighty events occurring, their petty affairs assumed an insignificance which was extreme. To meet the heavy increase in the cost of coal, the price of gas to ordinary consumers had been further raised 6d., to 4s. 6d. net per 1000 cubic feet, as from Jan. 1. The contractors for their new quay had brought an action for extras against them. The award was essentially in favour of the Company; but each side was ordered to pay its own costs.

## Effect of Reduced Lighting at Southend.

The abolition of street lighting and the enforcement of lighting and other regulations imposed on the locality, resulted in a substantial reduction in the quantity of gas sold during the six months ended Dec. 31. There was, as a matter of fact, a falling-off of practically 16 per cent., nearly all of which is attributable to the cause named. In the report which was adopted at the recent meeting, the Directors stated that the total number of consumers was 18,127, of whom 12,930 had prepayment meters. Owing to considerable economies in working having been effected, and an improved yield of residuals, the increased cost of coal had been borne, with the result that the profit and loss account, after transferring from the reserve fund account the sum of £278, showed a balance of £7559. Out of this, dividends were recommended for the half year on the original and new ordinary stocks at the rate of 5½ per cent. per annum, and on the new ordinary "B" stock at the rate of 5½ per cent. per annum, all less income-tax. This will absorb £7008. Captain Woosnam, who is serving with his regiment in India, owing to his military duties resigned the chairmanship of the Company, and the Deputy-Chairman (Mr. James Randall) declined nomination, on the grounds of age and not being resident in the district. Mr. J. H. Burrows, J.P., was thereupon elected to the office. Mr. W. W. Futcher, for some thirteen years one of the Auditors, had, owing to failing health, intimated that he did not intend to offer himself for re-election. In the course of his remarks to the proprietors, Mr. Burrows said that if they added the figures for wages to that for repairs and maintenance, and compared the total with that for the same half of the previous year, they would find there had been a saving of £118 each week of the six months. In connection with this, he should call attention to the report of the Engineer (Mr. C. S. Shapley), which stated that the work of putting the plant in a thorough state of efficiency was progressing favourably. On behalf of the Directors, he wanted to say that, in spite of this decreased expenditure of £118 per week, the state of the works had been improved. He said it for the encouragement of the Engineer, and as some acknowledgment of his services. In spite of all the unfavourable circumstances, the profit was £551 more than in the same period of the previous year. He pointed out that the Company had started the work of making ends meet by reducing the dividends, instead of increasing the price of gas.

**Reservoir Construction Stopped by the Ministry of Munitions.** At last Friday's meeting of the Metropolitan Water Board the Works Committee reported that they had received a letter from the Ministry of Munitions stating that, on grounds of urgent national interest, and acting under powers conferred by the Defence of the Realm and other Acts, it had been found necessary to give directions for the immediate cessation of the work being carried out for the Board at the Littleton reservoir works—the plant and machinery being required for the production of war material. The question of liability for any loss or expenditure arising from the cessation of work is, the Committee stated, engaging their attention.


# THE MAIN GAS FIRES.



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## ST. NICHOLAS—

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## Blyth Gas Company.

The report for the year ended Dec. 31, which was adopted at the annual meeting of the Company last Wednesday, stated that the revenue was £24,717, and the expenditure £19,488; leaving a balance of £5229 as profit for the year. The balance standing to the credit of profit and loss account was £7011, out of which the Directors recommended the payment of a dividend for the half year ended Dec. 31 on the ordinary stock at the rate of 6½ per cent. per annum, less income-tax, payable on March 2 next. This would absorb the sum of £1788; leaving a balance of £5222. This amount was subject to a sum of £1496 being transferred equally between the insurance and renewal fund accounts, as authorized at the general meeting held in March, 1914—thus leaving a net balance of £3726 to the credit of the profit and loss account. The interim dividend for the half year ended June 30 last was at the rate of 7¼ per cent. per annum; thus making the dividend for the year at the rate of 6⅞ per cent. per annum, less income-tax—the maximum allowed by the Company's statutory powers. The revenue account for the year showed an increase in receipts, when compared with last year, of £1780, and an increase in the expenditure of £1180. In consequence of stringent lighting restrictions the make of gas showed a decrease of 7 per cent. The values of coke and sulphate of ammonia had appreciably increased; while, on the other hand, tar had dropped in value. Coal had risen heavily in price, and, in consequence of this, together with the advanced cost of material and labour, the Directors had found it expedient to increase the price of gas from July 1 by 6d. per 1000 cubic feet. The extensions to manufacturing plant alluded to in the last report were proceeding slowly; material and labour both being difficult to obtain.

**Price of Gas at Neath.**—The Neath Town Council, at a meeting last Thursday, adopted a recommendation of the Gas Committee to increase the price of gas from 3s. to 3s. 4d. per 1000 cubic feet.

**Gas and Water Supply of Canterbury.**—Regret was expressed by Mr. S. Williamson, when occupying the chair at the annual meeting of the Canterbury Gas and Water Company, at the loss sustained through the death of Mr. Thomas Buckley, who had for nearly forty years been in charge of the water department. He said he could not speak too highly of the services Mr. Buckley rendered to the Company. He was a very clever man indeed, and designed a great many alterations and extensions to the water-works. The department has since been in charge of Mr. Swinnerton; while Mr. H. C. Page has been appointed Joint Gas and Water Engineer. Speaking of the business during the past year, the Chairman said it would have been a blessing if Kent coal had been better developed; but unfortunately the quality had up to the present proved so poor that it had only been possible to use about 15 per cent. mixed with North Country coal, though it had been tried over long periods from both Tilmanstone and Snowdown. A dividend was declared making, with the interim distribution, 8¼ per cent. for the year.

## South Staffordshire Water-Works Company.

Dealing with the accounts for the year ended Dec. 31, at the meeting of the Company, on Monday of last week, Mr. H. K. Beale, the Chairman, said that they were not quite as favourable as they were the previous year; but he did not suppose the most sanguine shareholder would expect such a good result in times like the present. In company with everyone else, they had been faced with abnormal increases in the prices of fuel and materials and in wages; but they were without the compensating advantage, which the ordinary manufacturer had, of being able to increase their prices in order to meet the increased cost. The prices at which they could sell water were limited by an old Act; and until Parliament saw fit to alter the scale, they were bound by it. The large increase in receipts was chiefly due to the great quantity of water purchased by manufactories making munitions of war; and a substantial amount of it was also due to the fact that they were supplying large military camps. He did not believe they had yet felt the full effect of the increased price of coal, of which they used something like 45,000 tons a year; and it would mean a considerable increase in their expenses next year. A substantial number of large consumers of water had been able to obtain their supplies at under the maximum charge. The Directors had revised the meter charges, and advanced the price to these consumers. The report of the Directors showed that the number of houses laid on during the year was 629, to which there had to be added 750 houses in Penkridge and Great Wyrley transferred to the Company's area of supply by their Act of last year, making the total supplied 145,740. The gross amount of water-rates was £166,705, as against £158,882 in the previous year. The sum of £2000 had been transferred to the depreciation fund, raising it to £55,202. After providing for interest on the debenture stock and the dividend on the preference stock, the amount remaining on the revenue account (including £9537 brought from last year) was £47,899. Out of this, an interim dividend on the ordinary stock at the rate of 6 per cent. per annum, less income-tax, was paid in September; leaving a net available balance of £28,677. A final dividend on the ordinary stock was recommended at the rate of 6½ per cent. per annum, less income-tax; making a total for the year of 6¼ per cent., less income-tax, and leaving £9209 to be carried forward.

**Newark Gas Company.**—At the half-yearly meeting of the Company, the Chairman (Mr. T. Bradley) expressed the satisfaction of the Directors at the fact that, despite the anxious time through which they had passed, it had not been found necessary to raise the price of gas beyond 2s. 11d. per 1000 cubic feet. The rise of 3d. per 1000 feet had been absolutely necessary. The receipts for public lighting during the six months amounted to only £16. Some difficulties had been experienced with the men at the works; but these had been surmounted—the Company at the present time paying an exceedingly good rate of wage to all employees. The report was adopted, and dividends declared of 10½ per cent. on the "A," 5 per cent. on the "B," and 7½ per cent. on the new ordinary shares.


# The Progressive Role.

¶ Progress in gas matters is the individual and collective concern of all who are engaged in the Industry.

¶ Exceptional responsibility, however, devolves upon the Gas Stove maker, the efficiency of whose productions is the culminating argument of the gas-selling appeal.

¶ Davis activities—guided always by a deep sense of this responsibility—have contributed very materially to Gas Progress.

¶ This is evidenced by the Company's invention of the Hygienic Gas Fire; by the establishment of their Permanent Exhibition Salons in the heart of the Metropolis; but above all by the Scientific Soundness and Constructional Merit of their many Specialities.

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## A Good Increase at Reading.

During the past year, the sales of gas at Reading increased by 44,514,300 cubic feet, or 6·44 per cent.; while there was an addition of 1019 to the number of consumers, and 2286 to the cookers and fires supplied. The number of consumers within the borough now closely approximates to the number of inhabited houses. These were the gratifying statements which the Chairman (Mr. J. Okey Taylor) was able to put before the proprietors at the annual meeting. He added that, in these trying times, it was matter for congratulation that they had been able to maintain the price of gas at so low a figure as 2s. 3d. per 1000 cubic feet. This was due to the sound financial position of the Company, which had enabled them to pass through a strenuous period with such satisfactory results. During the year the district of Theale had been taken over; and it was interesting to note that they were now supplying practically the whole of the area over which they possessed statutory power. The increased demand for gas had necessitated the provision of further storage accommodation; and they were fortunate in having entered into a contract for the erection of a new holder at a time when prices were normal. He was afraid, after Midsummer next, if the war continued, they would be unable to supply gas at the present rate. A bonus had been granted to the employees amounting to £1347 per annum, owing to the increased cost of living occasioned by the war. Of 300 employees before the war, 116 were now serving with the Forces. The works had been conducted by their Engineer (Mr. D. H. Helps) with his well-known ability and intelligence. The report was adopted, and dividends at the maximum rate of 5 per cent. per annum on the preference shares and ordinary stock (less income-tax) were declared.

**Increase in Price at Lancaster.**—Dealing with the accounts of the Gas Department at a meeting last week of the Lancaster Town Council, Sir N. W. Helme, M.P., pointed out that the minutes of the Committee (which were adopted) recommended that the price of gas be increased to 2s. 10d. per 1000 cubic feet to ordinary consumers, and that 27 cubic feet be allowed to prepayment consumers for 1d. It was not proposed to increase the price of gas for power purposes.

**Abnormal Consumption at Leighton Buzzard.**—Mr. R. Richmond presided at the annual meeting of the Company, and pointed out to the stockholders that during the past year there had been an increase of 17·2 per cent. in the quantity of gas sold—an abnormal consumption chiefly caused by the billeting of troops in the district. The accounts would, in normal times, have warranted a decrease in the price of gas; but there was every probability of a large falling-off in the profit on the current year's working. The great feature of the accounts was that, after paying the dividend at the rate of 5 per cent. per annum upon the ordinary stock (less income-tax), they were able to carry forward the maximum amount allowed under the Company's Act—namely, "the amount of one year's dividend at the authorized rate."

## Aldershot Gas, Water, and District Lighting Company.

The general business of the Company, in all departments, showed progress, the Directors remarked in their report for the half year ended Dec. 31. Sales of gas advanced nearly 19½ per cent., more water was supplied, and the electricity department completed the first year's working with a small, but nevertheless gratifying, revenue balance on the right side. With the co-operation of a devoted body of employees, the Company had fulfilled their obligations without any hitch or restriction whatever. The total revenue for the six months was £57,460, and the expenditure £45,045, leaving a surplus of £12,415. After providing for the dividends on the preference stock, and interest, the Directors recommended the full statutory dividends for the half year of £5 18s. per cent. per annum on the "A" stock, £4 8s. per cent. per annum on the "B" stock, and 5 per cent. per annum on the "C" consolidated stock—all less income-tax. Addressing the proprietors at the meeting, the Chairman (Mr. W. T. Robertson, J.P.) referred to the many difficulties that had been encountered. Touching on the question of labour, he said they employed a great number of men who were more or less experts. The moment the military authorities wanted men who were better than somebody else, they came out into civilian life, and took the best. Needless to say, in their search they found many men who were valuable to them, and as the result the Company had lost numbers of employees who were most useful to them. The Board hoped the war might end before there was any necessity for a further increase in the price of gas. The results of the half-year's working reflected the greatest credit on the General Manager (Mr. R. W. Edwards) and his staff. At a subsequent extraordinary meeting, the Directors were authorized to issue £25,000 of further capital, which the Chairman said had become necessary on account of the extraordinary circumstances in connection with the abnormal consumption of gas.

**Canterbury Gas and Water Stock.**—At a local auction sale, £1730 of stock in the Canterbury Gas and Water Company was offered, and some portion of it was disposed of, in lots of £10 each, at £17 5s. and £17 per lot.

**Gas Supply of Normanton.**—Dividends of 6 per cent. on the original stock and 4½ per cent. on the additional stock were declared at the half-yearly meeting of the Normanton Gas Company. Mr. John Armitage, who was in the chair, said the restricted lighting had reduced the output 6 per cent., and the cost of everything had gone up; but still the Directors were able to present a fairly satisfactory report. During the half year coal had cost on the average 4s. per ton more, which represented, on the tonnage used, £657; whereas the increased price of gas, which averaged 2½d. per 1000 cubic feet, had only yielded towards this extra cost £323. So that the benefits accruing from the installation of the new plant had had to go towards making up for the extra cost of coal and other materials.

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## Gloucester Gaslight Company.

The half-yearly general meeting of the Company was held on Monday of last week, when, in the unavoidable absence of the Chairman (Mr. R. V. Vassar-Smith), Mr. J. H. Jones (Deputy-Chairman) presided. The Directors, in their report for the half year ended Dec. 31, stated that the high prices at which the contracts for coal were made had very considerably added to the expenditure. The revenue from the sale of residuals had, however, greatly improved. The consumption of gas during the six months had slightly decreased; but the number of consumers had increased, and there had been a satisfactory addition to the cooking-stoves and gas-fires in use. The Directors recommended the payment for the half year of the maximum statutory dividend of 5 per cent. per annum (less income-tax) upon the consolidated stock. The report and accounts were adopted, and the dividend declared.

## Northwich Gas Company.

The accounts presented at the annual meeting of the Company showed decreases of £578 in receipts and of £1026 in expenditure, compared with the previous year's working. The profit for the year was £3865—an increase of £448. After paying interim dividends and interest on loans, there remained a disposable balance of £2365. In moving the adoption of the report and balance-sheet, the Vice-Chairman (Mr. W. J. Yarwood), who presided, expressed pleasure at being able to present such a satisfactory set of accounts, which he said reflected much credit on the Engineer and Manager (Mr. J. A. Brentnall) and the staff of the Company. The report recommended that dividends of 10 per cent. per annum (less income-tax) be paid on the ordinary shares, and 4 per cent. per annum (free of income-tax) on the preference shares, for the past half year, making, with the interim dividends, 8 and 4 per cent. respectively for the year. The report (which was adopted) also recommended that £250 be transferred from revenue account towards the cost of the Parliamentary Bill, leaving a balance of £402 to be carried forward.

**Newmarket Gas Company.**—The report and accounts adopted at the annual meeting of the Company showed that the net profit earned during the year ended Dec. 31 was £3699, which, after deducting debenture interest £162, and adding £3795 brought forward, made a sum of £7322, from which had to be deducted £600 written off investments for depreciation, leaving a balance standing at the credit of profit and loss account of £6732. Out of this, the Directors recommended the payment of a dividend at the rate of 6¾ per cent. for the year 1915 upon the original consolidated stock (less income-tax), £3510—leaving £3222 to be carried to the next account. Mr. R. Stephenson, J.P., who presided, pointed out that the carry-forward would be diminished by £515. The price of gas had been raised 4d., to 3s. 10d. per 1000 cubic feet, as from Jan. 1; and the result was that, under the sliding-scale, they would only be able to pay a dividend of 6¼ per cent. next year.

## Increased Private Consumption at Eastbourne.

The healthy condition of the business of the Eastbourne Gas Company was shown by the Chairman (Alderman J. C. Towner) when addressing the shareholders at the recent half-yearly meeting. After alluding with the deepest regret to the death of Dr. G. A. Jeffery (who had been Chairman for over half-a-century), he said the earnings of the six months ended Dec. 31 showed a sufficient profit to pay the dividend; but the help of the special purposes fund had been necessary. Built up in happier days, it was properly available at just such a time of stress as the present. The sum of £813 they paid to the dependants of employees serving with the forces, and £378 the cost of insurance against aircraft and bombardment, had been charged to this account. The over-spent capital account, and the heavy stocks necessarily held, had made it requisite to avail themselves of facilities afforded by the Company's bankers; and this explained an item of £447 for interest. There was a total requirement of £8743, while the profits were £574 less than this. The sales of gas for the half year had decreased by 2·27 per cent. compared with a year ago; yet taking the year as a whole there had been an increase of 2·5 per cent. And seeing that the average annual increased sales of gas over the past ten years had been 3·63 per cent., it would be clear that even war times failed to check the steady growth of the Company. The number of consumers had increased by 214. While there was a total decrease in the gas sold of 6,500,000 cubic feet, the reduced sales for public lighting were 11,000,000 feet; so that for private purposes there had been an increased sale of 4,500,000 cubic feet. The cost of coal during the last three years had risen from 19s. 9d. to 27s. 6¾d. per ton. The Resident Engineer and Works Manager (Mr. W. H. Hammond) had achieved excellent results in treating the gas so as to obtain toluol for explosives. Little as the Directors desired to increase the price of gas, it was not unfair to compare the present charge (2s. 10d.) at Eastbourne with that of the largest Company in the world—the Gas Light and Coke Company—who to-day charged 3s. 2d. That Company could bring coal to their own works on the Thames; while Eastbourne no longer had the use of Newhaven and had to bring coal to the Thames or the Medway, and then across Kent, Surrey, and Sussex to Eastbourne. The strong position of the Company lay in their low capital expenditure. About 8d. per 1000 cubic feet sufficed to meet all the demands for dividends and interest. Nearly seventy employees had joined the forces, and probably another twenty would do so. The officers and workmen had combined together to keep the flag flying; and it was felt that their efforts should be appreciated. The report was adopted, and dividends declared at the rates of 7¼ per cent. per annum on the "A" stock, 5¾ per cent. per annum on the "B" stock, and 5 per cent. on the preference stock.

The complete destruction of the Bonaventure Railway Station, at Montreal, has resulted in a loss which is estimated to probably exceed £80,000. The conflagration is believed to have been caused by defective electric wiring in the stationery room.


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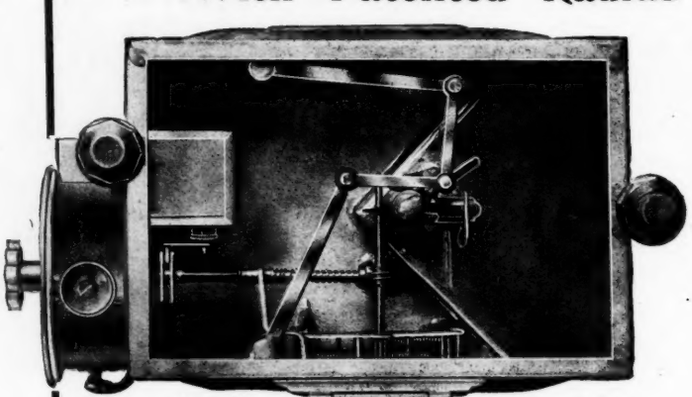

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## Plumbers and Reserved Occupations.

The position of the plumbing trade in relation to recruiting, and the serious difficulty experienced by the craft in carrying on public health and Government work owing to the shortage of men, was discussed at a meeting of the Board of Governors of the Institute of Plumbers at Doncaster. The Executive Committee had endeavoured to gain some relief for the trade, but without success. Raising the matter, Mr. J. Allinson said that in the list of scheduled trades which were reserved, mention was made of public-utility services—gas undertakings, light, and power corporations. It was positively ludicrous to say that the man employed laying mains in streets for a gas undertaking should be exempt, and that the man who connected from the mains to the houses of the people and to public buildings was not indispensable. If leakages occurred, he supposed it was the view of the authorities that they might remain for the duration of the war. The same remark applied to water undertakings. In defence of the plumbing trade, they could point to their roll of honour. Great numbers of employees and operatives had joined His Majesty's Forces, and everyone was suffering from the drain on staffs. He submitted that they had now reached a point when it ought not to be possible for the Government to recruit further from their staffs. Several other members stated they were greatly handicapped owing to the loss of men; and it was decided to seek an interview with Mr. Lloyd George personally, to lay the whole position before him with a view to Government action being taken to limit the recruiting of plumbers.

**Industrial Gas in South London.**—There is an announcement by the South Metropolitan Gas Company in the current number of their "Co-partnership Journal" to the effect that they are now offering a discount off the price of gas used in any process of manufacture requiring the utilization of heat. The Company point out that they are prepared to make a special study of any problem, and to prove the success of their suggestions, before advocating their adoption; and that they "have an offer which is well worth the consideration of all those who desire to reduce their production costs."

**Winchester Water and Gas Company.**—The revenue account figures for the past half year were larger than they had been in the history of the Company, the Chairman (Mr. J. C. Warner) informed the proprietors at the meeting. In 1905, they had a contract for Londonderry coal, at a cost delivered of 14s. 6d. per ton; while during the past six months coal not so good for the purpose had averaged about 25s. per ton. The extra revenue which they had obtained from an increase of 2d. per 1000 cubic feet in the price of gas amounted to less than one-half the additional cost of manufacture. The increase in the sales of gas came very largely from the prepayment consumers. The report presented showed that the balance of net revenue account available for dividend was £10,348; and dividends were declared for the half year of 4 per cent. per annum on the preference stock and 4½ per cent. per annum on the consolidated ordinary stock.

## A Good Half Year at Worthing.

Despite the stringency of the lighting regulations in force over the Company's area of supply, and which had reduced the possible receipts from public lighting by £490, the Directors of the Worthing Gaslight and Coke Company were able to submit a very satisfactory balance-sheet to the half-yearly meeting last Saturday. An expenditure of £4161 had been incurred in connection with the new gasholder at Goring, £2606 on connections to the holder and new mains and services, and £1117 on new meters and stoves during the half year, with the result that the total expenditure on capital account, after allowing for depreciation, had been increased from £147,628 to £153,989. On the revenue account, gas sales had brought in £16,359, an increase of £825 on the corresponding half year; rentals from meters, stoves, and prepayment fittings showed an increase of £111; and sales of residual products an increase of £1779. On the other side, the cost of coals had been £11,303, compared with £10,081—due to the advance of 6s. per ton on the new contract. Altogether the total manufacturing charges showed an increase of £1378, and the distribution charges an increase of £451; the latter being largely due to a considerable increase in the cost of materials. The increase from the sale of residual products, the Chairman (Mr. H. H. Gardner) pointed out, was mainly due to the higher value of coke and improved carbonizing. An increase of £218 from sulphate of ammonia was more than counterbalanced by a decrease of £392 from tar; but plant was being erected which would extract the light oils from the tar, and render it suitable for use on the roads. The Company had obtained 162 new customers during the half year, and had let out 72 additional stoves. Leakage had been reduced to 5¼ per cent. The report was adopted, and a dividend of 5 per cent. (less income-tax), on the consolidated stock, was agreed to.

**Metropolitan Water Board Deficiency.**—At last Friday's meeting of the Metropolitan Water Board the Finance Committee reported that, in accordance with section 15 (2) of the Metropolis Water Act, 1902, the precepts upon the contributory authorities in respect of the deficiency in the water fund for the year ended March 31, 1915, amounting to £94,873 7s. 4d., were issued on the 12th ult., and were payable on or before June 30 next. The rateable value, on April 6 last year, of the hereditments supplied with water by the Board was £53,414,747.

**Gas Plant Breakdown at Wilton.**—Referring at a meeting of the Wilton Town Council to a breakdown which had occurred at the gas-works, the Mayor (Mr. W. E. J. Stroud) said that matters were beginning to improve. The breakdown was chiefly owing to the very foul state that the works had got into, for they had been seriously neglected; and the climax came just when the Council were changing their foreman. Then the engine failed; and so it was impossible to get any gas at all. Attempts were made to repair the engine; but nothing could be done with it. Another had therefore been installed; and it was hoped that things would now be all right.


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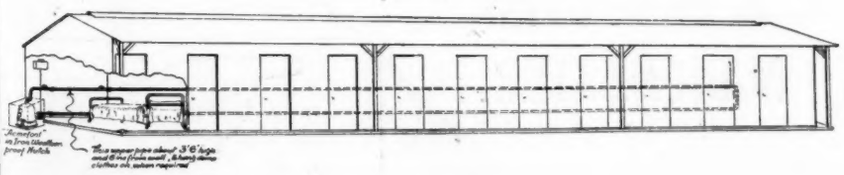

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**Newcastle and Gateshead Gas Bill.**—It was reported to the Gateshead Town Council last Wednesday that a petition had been deposited against the Newcastle and Gateshead Gas Company's Bill, and a Committee appointed to take such action as was considered best in the interests of the borough. Petitions against the Bill had, it was stated, been lodged by the Newcastle City Council, the Felling and Hebburn Urban District Councils, and the Durham County Council.

**Fatal Accident at the Derby Gas-Works.**—Last Tuesday night Andrew Shaw, a coke shoveller, was killed, and John Fox was seriously injured, through the collapse of some machinery at the Litchurch works of the Derby Gas Company. While engaged at their work, part of a machine suddenly gave way, and crashed down on the two men. Shaw succumbed almost immediately to shocking injuries. Fox was conveyed to the Derbyshire Infirmary in a serious condition.

**Price of Gas at Halifax.**—On p. 498 of last week's "JOURNAL," there appeared a paragraph, received from a local correspondent, in which it was stated that the Halifax Town Council had adopted the Gas Committee's recommendation of an alteration in the price of gas. We learn, however, from Mr. W. B. M'Lusky, the Engineer and Manager, that the statements contained therein are not correct, though the Gas Committee have at present under consideration certain reductions in the price of gas.

**Tipton Gas and Water Affairs.**—Yesterday (Monday) week, at the meeting of the Tipton District Council, it was reported that a letter had been received from the National Union of Gas Workers and General Labourers, applying for an increase of wages on behalf of men employed at the gas-works. The matter was referred to the Gas Manager (Mr. William Prince), the question to be left to his absolute discretion. It was also decided to resist any attempt of the South Staffordshire Water-Works Company to increase the water-rates.

**Electric Charges at Birmingham to be Raised.**—At to-day's meeting of the Birmingham City Council the Electric Supply Committee will ask sanction to an increase in charges. The current given by the department is divided into four classes: (1) Lighting, (2) power, (3) high tension, (4) traction. As regards (1) lighting and (2) power, the Committee are of opinion that it is undesirable to issue a fresh scale of charges. They consider that any increase made should be in the nature of a percentage addition to the total account; and the requirements of the department will be met if an increase of 15 per cent. is made on all charges in the scale under "lighting," and 20 per cent. on the charge for "power." They recommend that these increases be approved, to take effect from the March reading of the meters. The high-tension supply (3) is given under special agreements which now contain a coal clause, advancing the price of current with a rise in the price of coal; and the increased revenue derived from this source will compensate for the advance in costs. As opportunity arises, old agreements without the coal clause are being terminated, and the new form substituted. The Committee propose to apply to the traction supply (4) the terms of the coal clause in the high-tension agreement.

**Abolition of the Index Test at Manchester.**—The Manchester City Council agreed at last Wednesday's meeting to the proposal of the Gas Committee [*ante*, p. 491] to discontinue the testing of the indices of gas-meters, and in future simply to comply with the requirements of the Sales of Gas Act. The Chairman of the Committee (Alderman Kay) said that the argument for the testing of drums and indices of meters had disappeared so far as Manchester was concerned, because only dry meters were now used.

**Coal Shortage in Birmingham.**—For about an hour-and-a-half during the afternoon on Monday of last week, there was a stoppage of the Corporation tramway service in Birmingham, owing, the Electricity Committee stated, to the fact that, through the bad weather, the supply of coal to the department had been very seriously curtailed, Stocks therefore became exhausted; for since the outbreak of war, it has, of course, been impossible to accumulate large reserves, which led to the department being continually at the mercy of a dislocation of coal traffic. Fortunately, the Gas Committee offered some help.

**Barrmill's Water Supply.**—Last Saturday the scheme for the supply of gravitation water to the village of Barrmill was inaugurated, when the ceremony of turning on the water supply was performed by Mr. B. M. Knox, of Redheugh. The water is supplied through an arrangement with the Beith Water District—a main having been laid to the village from the Beith filters. The main is almost two miles long, and will supply the district with about 3 million gallons of water annually. Mr. Knox was presented with a silver rose-bowl as a memento of the occasion. The work was carried out by Messrs. Warren and Stuart, of Glasgow, and cost about £2000.

**Cork Gas Consumers' Company.**—Presiding at the half-yearly meeting of the Company, Mr. W. B. Harrington expressed deep regret at the loss of Mr. George Lynch, who had been a Director for forty years, and Chairman about half the time. As to the business of the half year, he said the troubles in regard to freights, coal, and general expense had increased; and, in the matter of coal, they had at times the greatest difficulty in securing any at all, and had to take what they could obtain at enormous cost. Worse still, the odd cargoes that did arrive were unsuitable for their plant, and caused no end of trouble at the works. The pipes which conveyed the gas from the retorts got so choked-up that it was with the greatest difficulty the supply was kept up. Recently, however, they had been having the right quality of coal, and he had every reason to believe that the supply would continue to be normal. In consequence of the increased expenses under every heading, they had had to reduce the dividend, and this notwithstanding the advance of 6d. per 1000 cubic feet to private consumers. They had also been compelled to increase the price by the same amount to the Corporation for public lighting. The difference in the cost of freight would mean on the amount of coal they used in twelve months fully £25,000 in excess of what they were in the habit of paying. There had been an increase in gas consumption during the past six months. The report was adopted, and a dividend was declared at the rate of 7 per cent. per annum for the half year.

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**Record Sales at Harrogate.**—The quantity of gas sold by the Harrogate Gas Company during the year 1915, the Directors stated in their report, was the highest on record—330,462,000 cubic feet, compared with 303,929,000 feet for 1914, or an increase of 26,533,000 feet. The business of the Company had been progressive, particularly in connection with sales of gas cooking and heating stoves.

**Labour Question at Kirkcaldy.**—The Manager of the Kirkcaldy Gas-Works (Mr. James Kincaid) is to take whatever steps he thinks necessary to secure men. It is suggested by the Committee that the Minister of Munitions may be approached with a view to getting some experienced men released from service with the national reserves. Employees are leaving Kirkcaldy to take up work at the new Admiralty Dockyard at Rosyth.

**Belfast Gas Supply Profits.**—At last Wednesday's meeting of the Belfast Corporation (after a motion to refer to the matter back had been defeated), the minutes of the Gas Committee were passed, containing the following resolution: "That the Council be recommended to authorize this Committee to grant £11,344 10s. 1d. for payment of the dividends and interest on the capital expenditure in connection with the City Hall, and also (provided the financial position of the undertaking will warrant it) up to a further sum of £10,000."

**Prague Water Supply Cut Off.**—News has been received at Amsterdam (through the Central News) that, owing to the collapse of a conduit belonging to the Prague Water-Works, the water conveying system has broken down. The interruption of the supply is so serious that a number of industries have had to close their works.

**Almondbank (Perth) Gas Supply.**—Complaints were recently made as to the unsatisfactory supply of gas for the Almondbank district of Perth; and Mr. David Vass, the Gas Manager, mentioned that before the connections were made to Almondbank the pressures of the gas there and also at the town's mains were taken, showing that there was evidently an ample gas supply for the district. The chief cause of any defect was, he said, the large quantity of gas used when certain singeing machines in the district were in operation. To remove the obstacles and provide an adequate supply they would require a high-pressure main from Perth, which he mentioned in a report he made eighteen months ago. Owing to the increased cost of materials, however, his estimate of the necessary work was a little over £3000, compared with £1350 when he reported originally. Mr. Vass has now been instructed to again take the pressures of the supply of the district, and ascertain if the restricted lighting had had any effect upon the supply for the place.

## STOCK MARKET REPORT.

THE Stock Exchange had another quiet week. The general tendency was dull. A cardinal point of attention was, of course, the desperate thrust of the Germans towards Verdun. But the calm and unperturbed confidence of our Allies in their power to defeat this enterprise has deeply impressed our own people; and the general sentiments regarding the issue are eloquently proclaimed by the conspicuous market strength of the last French loan. In our own Government securities, the War Loan and Consols have been easier—not unnaturally when the advent of another War Loan at no distant date is borne in mind. So the inclination is to "wait and see." Home Rails had but a poor week; but just before the close one or two lines picked up a bit. Americans were dull and inactive, partly from political factors and partly to the contraction of the market previously adverted to. Canadians did not win the support to which the fine business that they are, and have been, doing entitles them. In the Foreign Market, in addition to the French loan, strength was shown in Japanese, Portuguese, and Brazilian. South Africans were irregular. In the Miscellaneous Market, some of the more popular lives moved irregularly. Rubber and copper shares were affected by Government measures in regard to restrictions in dealing with the raw article; and oils and banks swayed. Some degree of dulness was imparted by disappointing dividend announcements by a couple of big concerns dealing in cement and insurance respectively. Among points of interest, the extension of the Dollars Mobilization Scheme still hung fire; the Treasury apparently being unable to arrive at an acceptable basis of borrowing and purchase powers. The position of the French-held securities scheme is regarded in the House with much dissatisfaction. Business in the Gas Market again showed more activity; and bargains were well distributed throughout the list of issues. Prices in one or two lines were easier, but steadiness was the general rule. In the Money Market, conditions were quite easy.

Bargains done for cash during the week were as follows: On Monday, Commercial 4 per cent. 73¼, ditto 3½ per cent. 68, Croydon 18½, 18²⅞, Gas Light ordinary 73½, ditto preference 74¾, 75, ditto debenture 60, Primitiva 2⅛, ditto preference, from 71s. to 73s., South Metropolitan 75⅝, 75½, 76. On Tuesday, Brentford debenture, 74, 74⅜, Commercial 4 per cent. 72½, 73, European 12¼, Gas Light ordinary 72¾, 72⅞, 73, 73⅛, 73⅜, ditto preference, 74½, 74¾, 75, ditto debenture 61, 61⅛, Imperial Continental 63¼, 63⅜, 63⅝, Primitiva 2 to 2 1/16, ditto preference 70s. to 72s. 6d., South Metropolitan 75, ditto debenture 60⅝, 60¾, South Suburban 82¼. On Wednesday, Commercial 4 per cent, 72½, 72⅝, Gas Light ordinary 72½, 72⅝, 73, 73⅛, 73½, ditto preference, 75, 75¼, ditto debenture 61, Imperial Continental 62½, South Metropolitan 75¼, ditto debenture 60⅝, 61. On Thursday, Commercial 4 per cent. 73, Gas Light ordinary 72½, 72¾, 73, 73¼, ditto preference, 74½, 75, ditto debenture 60⅛, Melbourne 98⅝, Primitiva 2⅛, ditto debenture 82. On Friday Gas Light ordinary 73¼, ditto debenture, 61⅛, Liverpool 87¾, 88, Primitiva 2 3/32 to 2⅛, ditto preference 70s. 7½d. to 72s. 6d., South Metropolitan 75½. On Saturday, Brentford "B" 82½, 83, Gas Light ordinary 72⅝, 73¼, ditto preference, 75, 75¼, ditto debenture 61, Imperial Continental 60, Primitiva preference, 43s. 6d., South Metropolitan, 76.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

| Issue. | Share. | When ex-Dividend. | Previous Div or Dividend & Bonus. | Last Dividend. | NAME. | Closing Prices. July 30, 1914. | Yield on Highest Closing Price. | Lowest and Highest Prices of Bargains. |
|---|---|---|---|---|---|---|---|---|
| £ | | | p.c. | | | | £ s. d. | |
| 1,651,868 | Stk. | April 8 | 2½ | 5⅛ | Alliance & Dublin Ord. | 59—64 | 3 18 2 | .. |
| 374,000 | " | July 10 | 4 | 4 | Do. 4 p.c. Deb. | 76—79 | 5 1 3 | .. |
| 280,000 | 5 | April 29 | 7½ | 3/- | Bombay, Ltd. | 5⅞—6⅜ | 5 17 8 | .. |
| 50,000 | 10 | Feb. 26 | 16 | 15/- | Bournemouth Gas and Water { 10 p.c. ; B 7 p.c. ; Pref. 6 p.c. ; 4 p.c. Deb. | 29—30 | 5 6 8 | .. |
| 338,110 | 10 | " | 7 | 7/- | | 15—15½ | 4 10 4 | .. |
| 115,000 | 10 | " | 6 | 6/- | | 13½—14 | 4 5 9 | .. |
| 159,740 | — | — | — | 4 | | .. | — | .. |
| 992,045 | Stk. | Feb. 26 | †14 | £6/- | Brentford Consolidated | 261—266 | 5 5 3 | .. |
| 734,920 | " | " | †11 | 55/- | Do. New | 204—209 | 5 5 3 | 82½—83* |
| 55,000 | " | " | 5 | 5 | Do. 5 p.c. Pref. | 109—111 | 4 10 1 | .. |
| 221,400 | " | June 11 | 4 | 4 | Do. 4 p.c. Deb. | 91—98 | 4 6 0 | 74—74⅞ |
| 217,880 | Stk. | Feb. 26 | 11 | 10⅜ | Brighton & Hove Orig. | 208—213 | 5 3 4 | .. |
| 244,300 | " | " | 8 | 7⅜ | Do. A Ord. Stk. | 154—159 | 5 0 8 | .. |
| 530,000 | 20 | Mar. 26 | 12½ | 22/6 | British | 44—45 | 5 11 1 | .. |
| 120,000 | Stk. | June 26 | 4 | 4 | Do. 4 p.c. Deb. Stk. | 88—90 | 4 8 11 | .. |
| 945,771 | Stk. | June 26 | 4 | 4 | Buenos Ayres 4 p.c. Deb. | 85—87 | 4 12 0 | .. |
| 100,000 | 10 | — | — | — | Cape Town & Dis., Ltd. | 1½—2⅛ | — | .. |
| 100,000 | 10 | — | — | 4/6 | Do. 4½ p.c. Pref. | 4—6 | — | .. |
| 100,000 | Stk. | June 26 | 4½ | 4½ | Do. 4½ p.c. Deb. Stk. | 70—75 | 6 0 0 | .. |
| 157,150 | Stk. | Feb. 26 | 5 | 5 | Chester 5 p.c. Ord. | 108—110 | 4 10 11 | .. |
| 1,513,280 | Stk. | Feb. 12 | 5/9/4 | 49/4 | Commercial 4 p.c. Stk. | 106—108 | 5 1 2 | 77½—73½* |
| 660,000 | " | " | 5½ | 46/8 | Do. 3½ p.c. do. | 103—105 | 5 1 6 | £8* |
| 475,000 | " | June 11 | 8 | 3 | Do. 3 p.c. Deb. Stk. | 69½—71½ | 4 8 11 | .. |
| 800 000 | Stk. | " | 4 | 4 | Continental Union, Ltd. | 76—79 | 5 1 3 | .. |
| 200 000 | " | " | 7 | 7 | Do. 7 p.c. Pref. | 115—118 | 5 18 8 | .. |
| 278,400 | — | — | — | 11½ | Croydon B and C 7 p.c. | .. | — | 181½—182½ |
| 492,270 | Stk. | — | 6 | 5⅜ | Derby Con. Stk. | 128—125 | 4 16 0 | .. |
| 55,000 | " | — | 4 | 4 | Do. Deb. Stk. | 102—104 | 3 16 11 | .. |
| 1,002,180 | 10 | July 29 | 10 | 10/- | European, Ltd. | 17½—18 | 5 11 1 | 12½ |
| 16,857,185 | Stk. | Feb. 10 | 4/17/4 | 42/- | Gas Light and Coke { 4 p.c. Ord. ; 3½ p.c. max. ; 4 p.c. Con. Pref. ; 3 p.c. Con. Deb. ; 10 p.c. Bonds | 98—102 | 4 15 6 | 72½—73½ |
| 2,600,000 | " | " | 3½ | 3½ | | 76—79 | 4 8 7 | .. |
| 4,062,235 | " | " | 4 | 4 | | 96—99 | 4 0 10 | 74½—75½ |
| 4,674,850 | " | June 11 | 8 | 3 | | 72½—74½ | 4 0 6 | 60—61½ |
| 130,000 | " | " | 10 | 10 | | .. | — | .. |
| 258,740 | Stk. | Mar. 12 | 5 | 4½ | Hastings & St. L. 3½ p.c. | 87—89 | 5 12 4 | .. |
| 70,000 | 10 | April 29 | 11 | 6 | Hongkong & China, Ltd. | 16½—16⅝ | 6 11 4 | .. |
| 86,600 | — | — | — | 9½ | Hornsey 7 p.c. | .. | — | .. |
| 131,000 | Stk. | Mar. 12 | 7¼ | 7½ | Ilford A and C | 151—154 | 5 2 4 | .. |
| 65,780 | " | " | 9⅜ | 5⅞ | Do. B | 115—118 | 5 8 0 | .. |
| 65,500 | " | June 26 | 4 | 4 | Do. 4 p.c. Deb. | 92—94 | 4 5 1 | .. |
| 4,940,000 | Stk. | May 14 | 9 | 4½ | Imperial Continental | 150—160 | 5 12 6 | 60—63½ |
| 1,235,000 | Stk. | Feb. 12 | 3½ | 3½ | Do. 3½ p.c. Deb. Red. | 84—86 | 4 1 5 | .. |
| 200,242 | Stk. | Mar. 12 | 6½ | 6½ | Lea Bridge Ord. 5 p.c. | 119—121 | 5 7 5 | .. |
| 2,498,903 | Stk. | Feb. 26 | 10 | 10 | Liverpool 5 p.c. Ord. { A ; B | 211—213 | 4 18 11 | 87½—88 |
| | | | | | | 146—148 | 4 14 7 | |
| 806,083 | " | June 26 | 4 | 4 | Do. 4 p.c. Pr. Deb. Stk. | .. | — | .. |
| 75,000 | 5 | June 11 | 6 | 2/- | Malta & Mediterranean | 4½—4⅝ | 6 9 9 | .. |
| 250,000 | 100 | April 1 | 4½ | 4½ | Met. of Melbourne { 4½ p.c. Deb. | 99—101 | 4 9 1 | 98½ |
| 541,920 | 20 | May 28 | 4 | 6/- | Monte Video, Ltd. | 11½—12 | 6 13 4 | .. |
| 1,975,892 | Stk. | July 29 | 4½ | 4½ | Newc'tle&G'tesh'd Con. | 98½—99½ | 4 10 6 | .. |
| 529,705 | Stk. | June 26 | 3½ | 3½ | Do. 3½ p.c. Deb. | 82—83 | 4 4 10 | .. |
| 55,940 | 10 | Feb. 26 | 7/14/0 | 7/8⅞ | North Middlesex 7 p.c. | 14—15 | 5 2 8 | .. |
| 300,000 | Stk. | May 14 | 8 | 8 | Oriental, Ltd. | 117—122 | 6 11 2 | .. |
| 60,000 | 5 | Mar. 26 | 10 | 1/- | Ottoman, Ltd. | 7⅞—7⅞ | 5 9 0 | .. |
| 60,000 | 50 | Feb. 26 | 13 | 65/- | Portsea, Island B | 128—131 | 4 19 8 | .. |
| 100,000 | 50 | " | 13 | 60/- | Do. C | 118—121 | 4 19 2 | .. |
| 52,000 | 50 | " | 10 | — | Do. D | .. | — | .. |
| 249,980 | 5 | April 29 | 8 | — | Primitiva Ord. | 5⅛—6 | 6 13 4 | 40/—43/6 |
| 499,960 | 5 | June 26 | 5 | 2/6 | " 5 p.c. Pref. | 4⅞—5 | 5 0 0 | 70/—73/- |
| 521,600 | 100 | June 2 | 4 | 4 | " 4 p.c. Deb. | 91—98 | 4 6 0 | 82 |
| — | — | — | — | 4 | " " " 1911 | .. | — | .. |
| 346,198 | Stk. | June 26 | 4 | 4 | River Plate 4 p.c. Deb. | 85—87 | 4 12 0 | .. |
| 150,000 | 10 | May 14 | 6 | 6/- | San Paulo { 6 p.c. Pref. ; 5 p.c. Deb. | 10½—11 | 5 9 1 | .. |
| 125,000 | 50 | July 1 | 5 | 5 | | 47—49 | 5 2 0 | .. |
| 135,000 | Stk. | Mar. 12 | 10 | 10 | Sheffield A | 223—224 | 4 9 3 | .. |
| 209,984 | " | " | 10 | 10 | Do. B | 222—224 | 4 9 3 | .. |
| 523,500 | " | " | 10 | 10 | Do. C | 220—222 | 4 10 1 | .. |
| 90,000 | 10 | May 28 | 9 | 6/- | South African | 10½—11½ | 7 16 6 | .. |
| 6,603,895 | Stk. | Feb. 10 | 5/4/0 | 44/- | South Met., 4 p.c. Ord. | 111—113 | 4 16 8 | 75—76 |
| 1,895,445 | " | July 10 | 3 | 3 | Do. 3 p.c. Deb. | 73½—74½ | 4 0 6 | 60⅝—61 |
| 224,820 | Stk. | Feb. 26 | 8½ | 8 | South Shields Con. Stk. | 157—159 | 5 6 11 | .. |
| 952,795 | Stk. | Feb. 26 | 6 | 48/4 | S'th Suburb'n Ord. 5 p.c. | 114—116 | 5 3 5 | 82½ |
| 60,000 | " | " | 5 | 5 | Do. 5 p.c. Pref. | 110—112 | 4 9 3 | .. |
| 135,000 | — | — | — | 48/4 | Do. West Kent. | .. | — | .. |
| 187,558 | " | June 26 | 5 | 5 | Do. 5 p.c. Deb. Stk. | 116—118 | 4 4 9 | .. |
| 629,740 | Stk. | May 14 | 5 | 5 | Southampton Ord. | 99—102 | 4 18 0 | .. |
| 120,000 | Stk. | Feb. 12 | 7½ | 7½ | Tottenham District { A 5 p.c. ; B 3½ p.c. ; 4 p.c. Deb. | 136—138 | 5 8 8 | .. |
| 782,275 | " | " | 6 | 6 | | 115—117 | 5 2 7 | .. |
| 181,255 | " | June 26 | 4 | 4 | | 87—89 | 4 9 11 | .. |
| 182,880 | 10 | Dec. 30 | 5 | — | Tuscan, Ltd. | 5—6 | 8 6 8 | .. |
| 149,900 | 10 | July 1 | 5 | 5 | Do. 5 p.c. Deb. Red. | 93—95 | 5 5 3 | .. |
| 236,476 | Stk. | Mar. 12 | 5 | 5 | Tynemouth, 5 p.c. max. | 108½—109½ | 4 11 4 | .. |
| | | | | | Wandsworth, Wimbledon, and Epsom— | | | |
| 80,000 | Stk. | Feb. 26 | 8⅝ | 78/9 | Wandsworth A 5 p.c. | 151—156 | 5 7 4 | .. |
| 255,636 | " | " | 6⅝ | 63/9 | " B 3½ p.c. | 129—134 | 5 2 7 | .. |
| 108,075 | " | " | 5/17/8 | 55/1½ | " C 3½ p.c. | 110—115 | 5 2 0 | .. |
| 852,000 | " | " | 6½ | 57/6 | Wimbledon 5 p.c. | 117—122 | 5 0 5 | .. |
| 98,000 | " | " | 6⅝ | 63/9 | Epsom 5 p.c. | 121—126 | 5 5 2 | .. |
| 88,416 | " | June 26 | 3 | 3 | 3 p.c. Deb. Stk. | 66—69 | 4 6 11 | .. |

* Ex. Div. † Paid on Old 10 p.c. and 7 p.c. Standard Stocks.

**A Satisfactory Year at Carmarthen.**—At the annual meeting of the Carmarthen Gas Company, presided over by Mr. John Lewis, the Directors reported that during the year 25,675,000 cubic feet had been sold; being an increase of 1,249,000 on the preceding twelve months. The Chairman said it was gratifying to be able to submit such a satisfactory result of the year's working. Mr. A. Soppit said that it was a curious fact that the experience of most gas companies was that when electric light came into competition with gas the takings of gas companies seemed to go up in every case. The report was adopted. Dividends at the rate of 7½ per cent. per annum, and 7 per cent. on the new ordinary shares, were declared for the year.

The Works Committee of the Southwark Borough Council report that they have received a report from the Borough Engineer to the effect that he has been in communication with the South Metropolitan Gas Company and the Gas Light and Coke Company with a view to reducing, on account of so much of the lantern having to be shaded, the amount of gas consumed. This conversion, the cost of which was very small, would be the means of effecting a considerable saving; and they had given instructions for the necessary work to be proceeded with.

The report for 1915 of Messrs. John Wright and Eagle Range, Limited, states that the balance of the revenue account for the year (after augmenting the contingent reserve), including £11,209 brought forward from the previous year, is £67,302. After deducting the interim dividends (£18,364) paid in August last, there remains at disposal the sum of £48,938, which the Directors recommend be appropriated as follows: To pay a dividend at the rate of 6 per cent. per annum for the half year on the preference shares (less income-tax), £2136; to pay a dividend of 2s. 6d. per share on the ordinary shares (free of income-tax), £26,800; to carry to reserve fund, £8000; and to carry forward to next year, £12,002. The profits on the gas-stove business have suffered considerably through the war; but this has in great measure been compensated for by these conditions having led to an exceptional development of the Company's business in industrial and other apparatus, and by the increasing increment yielded by the expansion of the Company's subsidiary business in directions outside the gas industry.

The British Vice-Consul at Baku (Mr. A. E. R. M'Donell) intimates that the Municipality of Baku are desirous of receiving tenders for the supply and delivery of 2170 water-meters of various types and of different capacities. No date for the receipt of tenders is given; but firms are recommended to forward them as soon as possible. Copies of the specification, in English, may be obtained by United Kingdom manufacturers of water-meters at the Commercial Intelligence Branch of the Board of Trade, No. 73, Basinghall Street, E.C.

The Bradford Chamber of Trade have vigorously protested against a circular recently issued by the Bradford Gas Department, inviting employers of labour, caterers for workpeople's meals, and others, to visit the department's show-room in Darley Street to witness demonstrations of a certain make of patent self-feeding water-boiler by gas, with a view to purchase. The protest of the Chamber is that of the keen controversy when the show-room was originally opened—that the place should not be used for sales, but only for demonstrations in order that the public may patronize local plumbers and gas-fitters by a wider use of gas. It is contended that the department promised to work on the latter lines, and it is also held that the particular boiler can be obtained through any plumber, and that, in any case, the Corporation should not push any particular make.

## NEWSPAPERS FOR NEUTRAL COUNTRIES.

The Secretary of the War Office has issued the following order:

> The public are informed that newspapers and other printed publications will not be sent to Neutral European Countries unless posted direct from the office of publishers or newsagents who have obtained permission from the War Office for this purpose. Persons desiring to send newspapers, &c., to Neutral European Countries should, therefore, give their orders for execution to publishers or newsagents who have obtained such permission.

The Publisher of the "JOURNAL" has obtained the required permission of the War Office; and he will, on receipt of instructions, forward copies direct from the office to any neutral country.

## WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

**Appointments, &c., Vacant.**

MANAGER (COKE-OVENS). Yorkshire Coking and Chemical Company, 11 and 12, Pall Mall, S.W.

MANAGER (WAREHOUSES). No. 302, Smith's Advertising Agency.

ASSISTANT. Ilfracombe Gas Company.

ANALYST. Powell Duffryn Company, Aberdare.

CLERK. Redditch Gas Company.

**Appointments, &c., Wanted.**

LADY DEMONSTRATOR, &c. No. 6162.

**Gas-Works (Ketton) for Sale.**

MIDLAND HOTEL, Ketton, March 17.

**Plant, &c. (Second-Hand), Wanted.**

PORTABLE LIGHT RAILWAY AND COAL-TROLLIES. No. 6161.

**Sale of Stock.**

ALDERSHOT GAS, &c., COMPANY. London Mart, March 14.

**TENDERS FOR**

**Coal.**

STIRLING GASLIGHT COMPANY. Tenders by March 20.

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